Long-Term Ecological Monitoring Field Sampling Plan for 2005

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May 2005

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Prepared for the
U.S. Department of Energy
Assistant Secretary for Environmental Management
Under DOE Idaho Operations Office
Contract DE-AC07-05ID14516

ABSTRACT

This Field Sampling Plan for the Long-Term Ecological Monitoring Project describes the field investigations to be conducted at the Idaho National Laboratory in 2005. This Field Sampling Plan and the *Quality Assurance Project Plan for Waste Area Groups 1, 2, 3, 4, 5, 6, 7, 10, and Deactivation, Decontamination, and Decommissioning* constitute the sampling and analysis plan supporting long-term ecological monitoring sampling in 2005. The data collected under this plan will become part of the long-term ecological monitoring data set that will be collected annually. The data will be used to determine the requirements for the subsequent long-term ecological monitoring that might last for decades.

The primary goals of the *Long-Term Ecological Monitoring Plan for the Idaho National Engineering and Environmental Laboratory*, in coordination with other INL monitoring plans, include the following:

- Verifying that the remedial objectives specified in Idaho National Laboratory Comprehensive Environmental Response, Compensation, and Liability Act Records of Decision are maintained for ecological receptors
- Determining that legacy contamination in the Idaho National Laboratory soils and waters does not have unacceptable long-term Sitewide ecological impacts
- Identifying and quantifying adverse ecological effects, if any, resulting from Idaho National Laboratory contamination
- Providing information to support the selection and evaluation of appropriate ecological indicators for long-term monitoring.

This Field Sampling Plan provides guidance for the site-specific investigation in 2005, including sampling, quality assurance, quality control, analytical procedures, and data management. Use of this Field Sampling Plan helps ensure that the resulting monitoring data are scientifically valid, defensible, and of known and acceptable quality.

The areas to be investigated as part of this Field Sampling Plan include the Big Lost River sinks and playas, the Mass Detonation Area, the Naval Ordnance Disposal Area, the Railcar Explosion Area, the Test Area North, the TRA-08 cold waste ponds, one on-Site terrestrial reference area, and one off-Site aquatic reference area. Both analytical and effects data will be collected during the 2005 field activities. Analytical data will include biotic (e.g., whole mice and plant tissues) and abiotic (e.g., soil) samples. Effects data will range from surveys of vegetative cover and small mammal population estimates to histopathology studies of captured mice.

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ACRONYMS

AA alternative action

AOC area of concern

CERCLA Comprehensive Environmental Response, Compensation, and Liability Act

CFA Central Facilities Area

CFR Code of Federal Regulations

COC chain of custody

COPC contaminant of potential concern

DAR Document Action Request

DOE U.S. Department of Energy

DQO data quality objective

DS decision statement

EPA U.S. Environmental Protection Agency

ER environmental restoration

ESH&QA environmental, safety, health, and quality assurance

FSP field sampling plan

FTL field team leader

FY fiscal year

GDE guide

HMX Her Majesty's Explosive

HSO health and safety officer

HTRE Heat Transfer Reactor Experiment

ICP Idaho Completion Project

ICPP Idaho Chemical Processing Plant

IET Initial Engine Test

INEEL Idaho National Engineering and Environmental Laboratory

INL Idaho National Laboratory

INTEC Idaho Nuclear Technology and Engineering Center

JSA job safety analysis

JSS job site supervisor

LOFT Loss of Fluid Test

LTEM long-term ecological monitoring

MCP management control procedure

MDA Mass Detonation Area

NA not applicable

NIST National Institute of Standards and Technology

NODA Naval Ordnance Disposal Area

NRF Naval Reactors Facility

OU operable unit

PLN plan

PPE personal protective equipment

PRD program requirements document

RCRA Resource Conservation and Recovery Act

RCT radiological control technician

RDX Royal Demolition Explosive

RI/BRA remedial investigation/baseline risk assessment

RI/FS remedial investigation/feasibility study

RWMC Radioactive Waste Management Complex

SAM Sample and Analysis Management

SMC Specific Manufacturing Capability

SNAPTRAN Systems for Nuclear Auxiliary Transient

SOW statement of work

TAN Test Area North

T/E threatened and/or endangered

TEM template

TNT trinitrotoluene

TPH total petroleum hydrocarbon

TPR technical procedure

TRA Test Reactor Area

TSF Technical Support Facility

USFWS U.S. Fish and Wildlife Service

WAG waste area group

WGS Waste Generator Services

WRRTF Water Reactor Research Test Facility

Long-Term Ecological Monitoring Field Sampling Plan for 2005

1. INTRODUCTION

This Field Sampling Plan (FSP) was prepared for the Long-Term Ecological Monitoring (LTEM) Project of the Idaho Completion Project (ICP) at the Idaho National Laboratory (INL). This plan identifies the activities for the characterization project, including health and safety requirements, to perform sampling. This plan was prepared according to the requirements outlined in ICP Management Control Procedure (MCP) -9439, "Environmental Sampling Activities at the INEEL"; MCP-3562, "Hazard Identification, Analysis, and Control of Operational Activities"; and Template (TEM) -104, "Model for Preparation of Characterization Plans."

This characterization plan establishes the procedures and requirements that will be used to perform field sampling and analysis as well as minimize health and safety risks to persons performing sampling of the Big Lost River sinks and playas, the Mass Detonation Area (MDA), the Naval Ordnance Disposal Area (NODA), the Railcar Explosion Area, Test Area North (TAN), the TRA-08 cold waste ponds, the terrestrial reference area, and the aquatic reference area. Both analytical and effects data will be collected during the 2005 field activities. Analytical data will include biotic (e.g., whole mice and plant tissues) and abiotic (e.g., soil) samples. Effects data will range from surveys of vegetative cover and small mammal population estimates to histopathology studies of captured mice. This plan contains information about the characterization activity, analytical and quality assurance/quality control requirements, hazards involved in performing the task(s), and the specific actions and equipment that will be used to protect persons working at the task site.

1.1 Project Objectives

The objective of the FSP activities is to provide data and guidance for yearly sampling in accordance with the Long-Term Ecological Monitoring Plan for the Idaho National Engineering and Environmental Laboratory (INEEL 2004). The LTEM Plan presents the approach for LTEM to assess effects from contaminants at the INL that are covered under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) (42 USC § 9601 et seq.). The LTEM Plan approach is based on the results of the Operable Unit (OU) 10-04 ecological risk assessment presented in the Comprehensive Remedial Investigation/Feasibility Study for Waste Area Groups 6 and 10 Operable Unit 10-04 (DOE-ID 2001). The OU 10-04 ecological risk assessment was an INL-wide assessment with the primary purpose of evaluating risk to ecological receptors from contamination released to the environment from INL activities. The LTEM Plan was developed to meet the requirement of implementing Sitewide ecological monitoring set forth in the Record of Decision Experimental Breeder Reactor-I/Boiling Water Reactor Experiment Area and Miscellaneous Sites (DOE-ID 2002).

The Quality Assurance Project Plan for Waste Area Groups 1, 2, 3, 4, 5, 6, 7, 10, and Deactivation, Decontamination, and Decommissioning (DOE-ID 2004) governs Federal Facility Agreement and Consent Order for the Idaho National Engineering Laboratory (DOE-ID 1991) project work performed by INL employees, subcontractors, and employees of other companies or U.S. Department of Energy (DOE) laboratories.

The areas to be investigated in 2005 include the Big Lost River sinks and playas, the MDA, NODA, the Railcar Explosion Area, TAN, the TRA-08 cold waste ponds, one on-Site terrestrial reference area, and one off-Site aquatic reference area.

The terrestrial reference area will be sampled this year for analytical data. The terrestrial reference locations match the geological, hydrological, and ecological conditions at the contaminated sites to the greatest extent possible. Reference area data give a baseline of natural, ambient conditions for all media in the absence of site-related contaminant impacts. Flora and fauna population data for selected species at these sites will be collected every year according to the LTEM Plan (INEEL 2004).

For comparison to the Test Reactor Area (TRA) cold waste ponds and other waste ponds on the INL, Chilly Slough (near Mackay reservoir) will be the aquatic reference area. Unfortunately, the pond areas differ greatly in their characteristics, and Chilly Slough was chosen as a reference area since it has the same plant species, is easily accessible, and is out of the INL wind pattern. Chilly Slough will be sampled this year for analytical data.

In addition to the planned sampling, opportunistic plant, soil, or small mammal collection at the areas of concern may occur as determined by the technical lead. One reason for opportunistic collection would include indicators of possible contaminant exposure. For example, in 2003, the field team observed several mice that had facial defects at TRA. In 2005, the technical lead can send for laboratory analyses for any plant, soil, or small mammal exhibiting an indicator of possible effects from contaminant exposure. In addition, if contamination (e.g., explosive residue) is visually apparent, the technical lead may move a sample grid to better assess the area.

As discussed in the LTEM Plan (INEEL 2004), the Record of Decision (DOE-ID 2002) authorized selected studies. One ongoing study includes sending splits of soil and vegetation samples to an INL field-based radionuclide measurement system and to an off-Site contract laboratory for data comparison. Increased use this year of the less costly INL field-based radionuclide measurement system at the Big Lost River sinks and playas will allow the project to have more samples analyzed for better characterization of potentially contaminated areas.

A study will be conducted this year to evaluate kidney-to-body and liver-to-body weight ratios in deer mice. In 2004, a significant difference between the liver-to-body weight ratio from a contaminated site to background was observed (data analysis in process). Deer mice will be harvested this year on the terrestrial reference locations to provide additional information on the natural and yearly variation of these parameters.

During the summer of 2004, pitfall and funnel trapping with the aid of drift fences and quadrat studies were evaluated for determining the presence and density of reptile/amphibian species at selected sites. These in combination with observational studies will continue to be evaluated in 2005.

1.2 Site Description

The INL occupies about 2,305 km² (890 mi²) of the northwestern portion of the Eastern Snake River Plain (see Figure 1-1). The Snake River Plain is about 97 km (60 mi) wide and over 600 km (370 mi) long. A few buttes exist on the INL, but most of the land is flat to a gently rolling, high-desert terrain that lies about 1,524 m (5,000 ft) above sea level.

The INL is a semiarid desert with a mean annual precipitation of less than 22 cm (9 in.) and with large daily and seasonal temperature fluctuations. In the winter, the temperature might not rise above freezing, and topsoils usually remain frozen from mid- to late November through early March. Snow

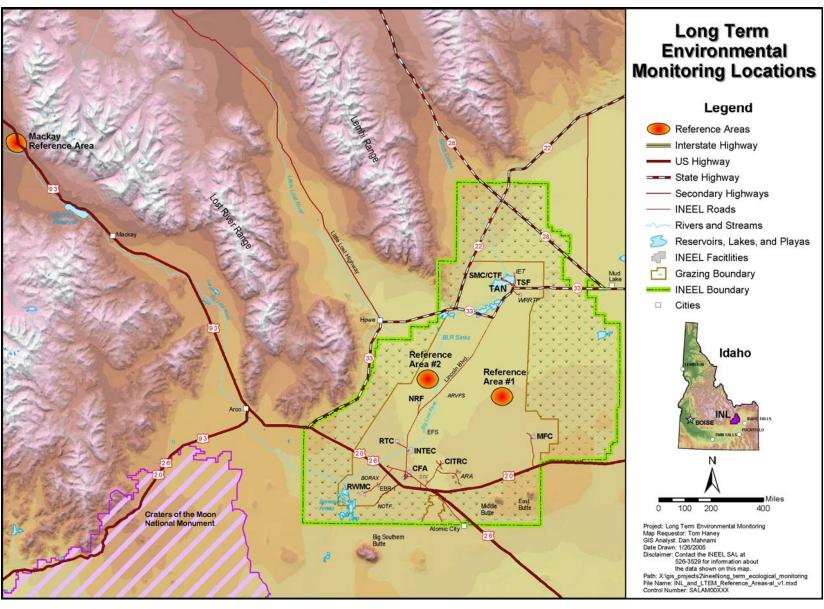


Figure 1-1. Map of the Idaho National Laboratory showing the locations of major facilities and sampling areas.

cover typically persists for 2 to 3 months, but it is highly variable between years. During the summer, low humidity and clear skies result in relatively high maximum temperatures at 30 to 35°C (85 to 95°F) and at night temperatures drop to below 10°C (50°F).

Vast, primarily undeveloped sagebrush flats interrupted by basalt outcrops isolate INL facilities. Because its border is secured, the INL is a refuge for plants and wildlife, and its core is arguably the largest area of undeveloped and currently ungrazed sagebrush steppe outside national parks in the Intermountain West. Domestic grazing has been eliminated for over 50 years on large areas in the core of the Site. In addition, large numbers of raptors and mammals migrate onto the INL site because of its location at the mouth of several mountain valleys. During some years, large numbers of raptors, pronghorn, and sage grouse winter on the INL.

1.3 Sampling Locations

Yearly sampling refers to data types collected annually, although the location at which data are collected may vary. Table 2 of the LTEM Plan (INEEL 2004) provides the locations and suggested initial sampling year for each area of concern. In 2005, the Big Lost River sinks, NODA, Railcar Explosion Area, TRA-08 chemical waste pond, and the reference areas have been identified for sampling. Additional sampling also has been identified for 2005 at the MDA and Initial Engine Test (IET) Facility.

Yearly sampling will be performed as discussed in the LTEM Plan (INEEL 2004) and in this FSP. The areas of concern and the sampling to be performed in 2005 are summarized in Table 1-1 and discussed below.

1.3.1 Big Lost River Sinks

The Big Lost River sinks (the "sinks") and related ephemeral playa lakes are located in the northwest section of the INL. A playa is a flat-floored bottom of an undrained desert basin that sometimes becomes a shallow lake. During average hydrologic years, the Big Lost River disappears north of Arco, Idaho, before it reaches the Snake River Plain and the INL. During high precipitation years, the Big Lost River flows past Arco, Idaho, onto the INL where it eventually reaches the sinks and playas. http://www.deq.state.id.us/water/data_reports/surface_water/tmdls/big_lost_river/big_lost_river.cfm (Chapter 1, pages 1 to 18, pdf). The river channel meanders past several facilities and CERCLA sites, transporting sediments and possibly contaminants to the sinks where the water evaporates and infiltrates.

1.3.1.1 Environmental Setting—Big Lost River Sinks and Playas. Much of the INL is located within the Mud Lake-Lost River Basin, also known as the Pioneer Basin (www.id.doe.gov/EIS/Chpts/ch4/005_4-8_4-8-1.pdf). This closed drainage basin is fed by three main streams—the Big Lost River, Little Lost River, and Birch Creek—which collectively drain the several thousand square miles of mountains and valleys to the north and west of the INL. Because this is a closed basin, the inflowing streams terminated historically in a series of sinks and playas that trapped the water (see Figure 1-2 for the Big Lost River sinks and Figures 1-3, 1-4, and 1-5 for the playas). With no outflow possible, water reaching the sinks and playas is able to exit only by infiltration into the ground or to the atmosphere by way of evapotranspiration. These sinks and playas occupy a portion of ancient Lake Terreton, which, under the cooler, wetter conditions of the late Pleistocene, covered approximately 90 km² of the northern half of the INL (Martin 2004). Mud Lake is a remnant of Lake Terreton, the shoreline of which was roughly coincident with the 4,800-ft (1,463-m) contour (Hackett and Smith 1992).

Table 1-1. Sampling activities by sampling area planned for Fiscal Year 2005.

Tr. 1	TANI	NODA	D '1	MDA	TOP 07	TD 4 008	Big Lost	Terrestrial	Aquatic
Tasks	TAN	NODA	Railcar	MDA	TSF-07	TRA-08 ^a	River Sinks	Reference Area	Reference Area
Population data									
Birds	X	X	X	_	_	_		X	_
Mammals	X	X	X	X				X	
Plants	X	X	X	_	X	_		X	
Reptiles	X	X	X	_	_	_		X	
Soil fauna	X	X	X					X	
Analytical data									
Soil	X	X	X	_	_	_	X^b	X	
Vegetation	X	X	X	_	_	_		X	
Mammal	X	X	X	X^{c}	_	_		X	
Water	_	_	_	_	_	X	—	_	X
Sediment	_	_	_	_	_	X		_	X
Aquatic plant	_	_	_	_	_	X			X
Effect data									
Histopathy	X	X	X	X	_		_	X	_
Earthworm toxicity	X	X	X	_	_		_	X	_
Seedling toxicity	X	X	X			—	<u>—</u>	X	
Disturbance and soil characte	Disturbance and soil characterization								
Disturbance ranking	X	X	X	X	_	X		X	
Soil	X	X	X	X		X	<u> </u>	X	_

a. Sampling for population data will not be performed for TRA-08. Sampling at Plots 8 and 9 at TRA in FY 2003 will be used to represent this pond.

b. Sampling at the Big Lost River sinks will be performed using a screening approach, since this is such a large area with a large amount of uncertainty as to contaminant deposition.

c. Sampling for deer mice, soil, and disturbance ranking will be performed at the MDA. The MDA was sampled in FY 2004, but deer mice were not present in enough quantity to obtain a sample.

FY = fiscal year

MDA = Mass Detonation Area

NODA = Naval Ordnance Disposal Area

TAN = Test Area North

TSF = Technical Support Facility

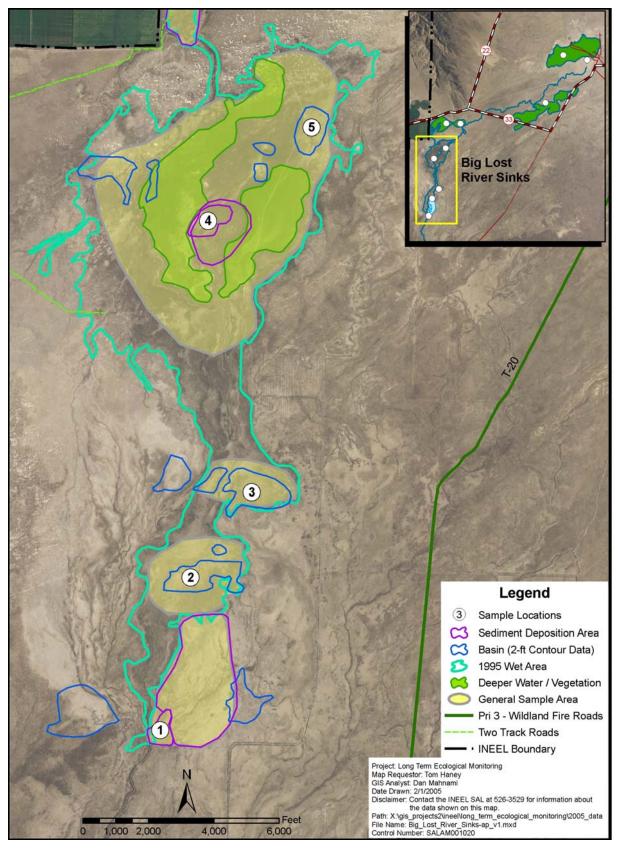


Figure 1-2. Map showing the Big Lost River sinks and the general location.

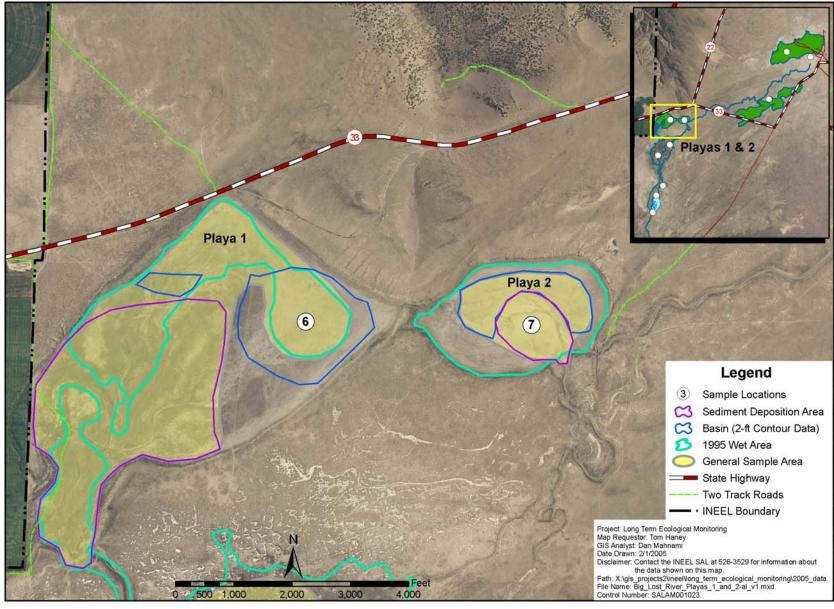


Figure 1-3. Map showing Playas 1 and 2 and the general location.

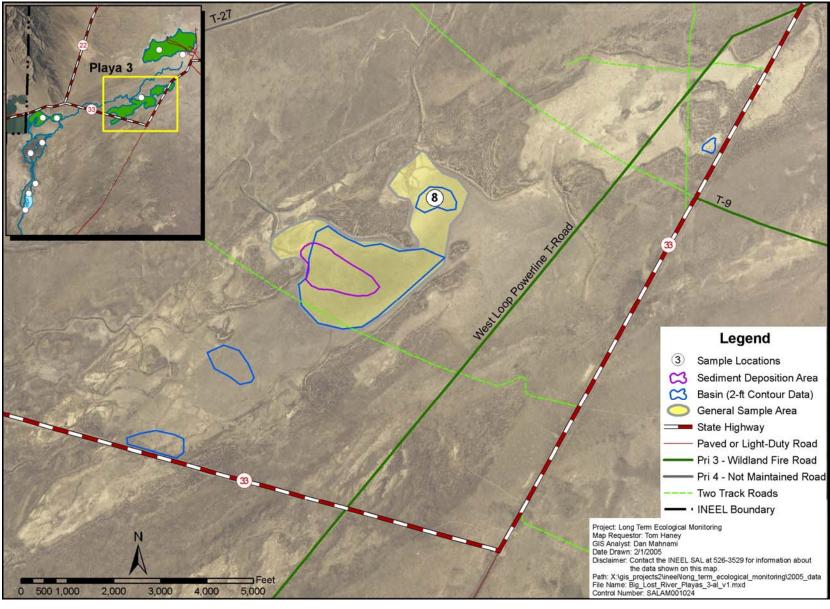


Figure 1-4. Map showing Playa 3 and the general location.

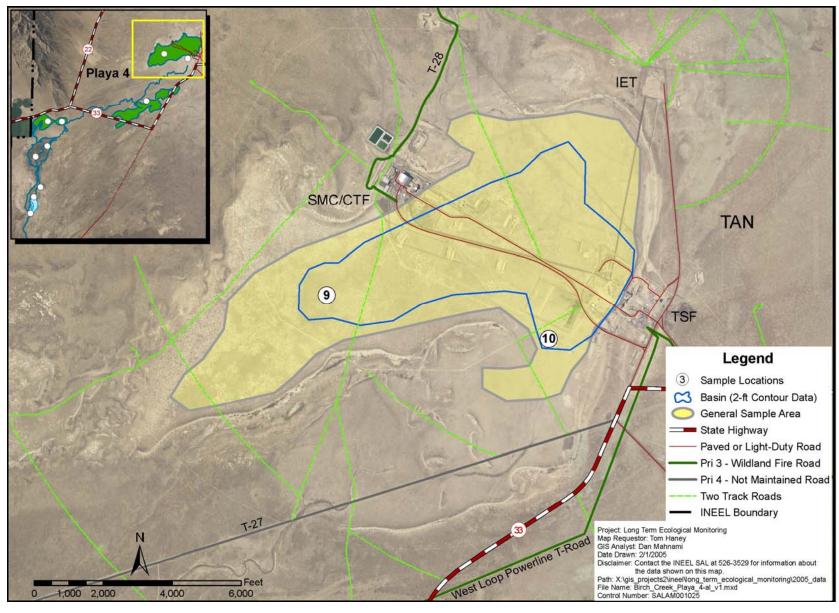


Figure 1-5. Map showing Playa 4 and the general location.

Historically, water entering the INL from the Big Lost River first reached the Big Lost River sinks area (Figure 1-2). In times of heavy flow, water was able to flow from the Big Lost River sinks into a series of playas (1, 2, and 3). Water from Birch Creek naturally flowed into Playa 4, also known as the Birch Creek playa. In very heavy run-off years, Playas 3 and 4 were connected. The Little Lost River also historically terminated in a series of sinks and playas, but these are located just northwest of the INL boundary.

Water flow in the Big Lost River, Little Lost River, and Birch Creek has been altered dramatically, with the net result being that water flow into the sink and playa areas has been significantly reduced both in terms of volume and duration. Beginning as early as the 1880s, these three streams began to be diverted for agricultural irrigation. This water diversion was boosted by passage of the Carey Act of 1894, which authorized western states to acquire undeveloped and arid federal lands within their boundaries, provided that this land be reclaimed and made agriculturally productive. The largest agricultural diversion project in the area included the construction of the Mackay dam, which was finally completed in the 1920s after many years of delays. Among the other projects in the region during the early 1900s was the Birch Creek Cooperative Irrigation Project that brought water to Butte County in 1909. Much more recently, a low-head hydropower diversion was built on Birch Creek, which now diverts water before it reaches Playa 4. Collectively, the various early diversion projects undoubtedly had an impact on the quantity and quality of waters reaching the sinks and playas, but these have never been quantified.

As facilities were developed at what is now the INL, it became evident that flood control was needed to reduce the potential for flooding of the Idaho Chemical Processing Plant (ICPP) and TRA areas, which were constructed within the Big Lost River flood plain. Flooding was observed to result primarily from the formation of ice jams that blocked the flow of the river. Coupled with the inability of water to penetrate the frozen soil, these conditions caused the Big Lost River to overflow its banks. To address this problem, a small diversion dam and channel were constructed in 1958 at the southernmost point of the Big Lost River. This dam and channel result in waters being diverted from the river to topographic depressions known as Spreading Areas A, B, C, and D. Therefore, this diversion prevents much of the water flowing onto the INL site from continuing north to the sink and playa area. However, during the winter of 1983–1984, extremely wet and cold conditions resulted in the formation of ice jams between Spreading Areas A and B. This resulted in water levels rising to within a few inches of overtopping the diversion dam and threatened the Radioactive Waste Management Complex (RWMC). As a result, the diversion dam and containment dikes were raised several feet and the diversion channel was enlarged to provide additional flood protection.

Despite the anthropogenic alteration of the Big Lost River, Little Lost River, and Birch Creek systems, water flow still reaches the sinks and playas during most years. During the wet period of the early 1980s, much of the playa system was flooded during run-off each year. This wet period was followed by a prolonged drought, and the summer of 1993 was the first time in 7 years that flow from the Big Lost River was observed to actually reach the playas (Martin 2004). In June and July of 1995, however, water flowed into the sinks and playas for over 2 months.

Before the area was disturbed, the system of sinks and playas of the Big Lost River, Little Lost River, and Birch Creek supported an extensive and diverse unique wetland system. However, only very minimal surveys of the presence and abundance of plant and animal species have ever been conducted in this area. In 1995 and 1997, an INL team conducted a survey of plants and aquatic invertebrates in the area. Although by no means comprehensive, the field team observed 18 species of waterfowl and shorebirds (including over 500 ducks, some with broods) and several other bird species, including two peregrine falcons. Thousands of ephemeral Great Basin spadefoot toads (*Scaphiopus intermontanus*) were observed, as were invertebrates representing many different orders. Although remnants of these systems

remain, the long-term impacts of the various water diversion systems on the aquatic communities are uncertain.

The U.S. Fish and Wildlife Service (USFWS) provides a quarterly list of threatened and endangered (T/E) species and other species of concern for the INL site. The current (December 2004) USFWS list includes two T/E species for the site: the bald eagle (*Haliaeetus leucocephalus*) and the gray wolf (*Canis lupus*). The gray wolf is a recent addition to the INL list, but it is designated as an "experimental/non-essential population." The USFWS also has designated several other animal species as well as one plant species as sensitive. Mammals receiving this designation are Merriam's shrew (*Sorex merriami*), pygmy rabbit (*Brachylagus idahoensis*), Townsend's big-eared bat (*Corynorhinus townsendii*), long-eared myotis (*Myotis evotis*), and small-footed myotis (*Myotis subulatus*). The three birds listed are the ferruginous hawk (*Buteo regalis*), greater sage grouse (*Centrocercus urophasianus*), and the long-billed curlew (*Numenius americanus*). The northern sagebrush lizard (*Sceloporus graciosus*) is the single reptile on the USFWS list, and painted milkvetch (*Astragalus ceramicus* var. *apus*) is the only plant.

Other federal agencies such as the U.S. Forest Service and the U.S. Bureau of Land Management also provide lists of sensitive species. Among the species recognized by other federal agencies that might be found on the INL site are four bird species: the peregrine falcon (*Falco peregrinus*), the northern goshawk (*Accipiter gentilis*), the loggerhead shrike (*Lanius ludovicianus*), and the burrowing owl (*Athene cunicularia*).

1.3.1.2 Contaminants of Potential Concern and Sampling—Big Lost River Sinks. The Big Lost River flows through areas on the INL where contaminants are or have been present. Table 1-2 lists the contaminants of potential concern (COPCs) from each waste area group (WAG). The Big Lost River flows closest to the Idaho Nuclear Technology and Engineering Center (INTEC) (WAG 3), but it also flows through and has probably flooded unexploded ordnance-related CERCLA sites in WAG 10. See Figures 1-6 and 1-7 (NODA and Railcar Explosion Area) for the relationship of the Big Lost River channel to these sites. Due to the large number of contaminants that could be present at the site, a screening approach will be used. The screening will be focused on the contaminants most likely to be present. Large quantities of trinitrotoluene (TNT) and Royal Demolition Explosive (RDX) were used for explosive experiments at the INL during the 1940s. Chunks of both TNT and RDX, as well as stained soil, are still present at the Railcar Explosion Area and NODA as well as other sites.

The INTEC (formerly known as the ICPP) has been in operation since 1954 and has historically been a uranium reprocessing facility for defense projects and for research and storage of spent nuclear fuel. Over the past decades, inadvertent and operational releases of radioactivity and other contaminants from the ICPP processing plants and support systems have been released to the environment (see Section 1 of the *Comprehensive RI/FS for the Idaho Chemical Processing Plant OU 3-13 at the INEEL—Part A, RI/BRA Report [Final]* [Rodriguez et al. 1997]).

Mercury was used extensively at the Technical Support Facility (TSF) from the late 1950s to the early 1960s. The Heat Transfer Reactor Experiment No. 3 (HTRE-III), part of the Advanced Nuclear Programs, used mercury as shielding for its reactor. It is reported that mercury leaked from HTRE-II onto the ground and railroad system every time the unit was moved and the mercury beads were found in the soil near the TAN-647 storage location in the mid-1980s. In addition, a large spill of mercury reportedly occurred near the southwest corner of TAN-607 in 1958 (from the description of TSF-08, Table 1-2 of the *Comprehensive Remedial Investigation/Feasibility Study for the Test Area North Operable Unit 1-10 at the Idaho National Engineering and Environmental Laboratory* [DOE-ID 1997]).

Table 1-2. Contaminants of potential concern summarized from the waste area group ecological risk assessments (INEEL 2004).

COPCs	WAG 1	WAG 2	WAG 3	WAG 4	WAG 5	WAG 8 ^a	WAG 9	WAGs 6 and 10
Inorganics	_	_	_	_	_	_	_	_
Arsenic ^b	X	X		X	X	X	X	_
Antimony ^b	X	_		_	_			_
Barium	X	X	X	X	_	_	X	_
Cadmium	X	X	X	X	X	_	X	
Chromium (III)	X	X	X	X	_	_	X	_
Chromium (VI)	_	_	X			_	X	_
Cobalt	X	_	_	X	X	_	_	_
Copper	X	X	_	X	X	_	X	X
Cyanide ^b	X	_				_	X	_
Lead	X	X	X	X	X	X	X	X
Manganese	X	_	_	X	X	_	X	_
Mercury	X	X	X	X	X	X	X	_
Nickel	X	_	X	X	X	_	X	_
Selenium	X	X	X	X	X	_	X	_
Silver	X	X	_	X	X	_	X	_
Strontium		_	X	_	_	_		
Thallium	X	X			X	_	_	
Vanadium	X	_	_	X	X	_	X	
Zinc	X	X	_	X	X	_	X	X
Organics	_	_	_	_	_			_
1,3-Dinitrobenzene	_			_	_	_	_	X
2,4-Dinitrotoluene		_	_	_	_	_	_	X
2,6-Dinitrotoluene	_	_		_	_	_		X
2-Amino-4,6-dinitrotoluene ^c		_				_		X
4-Amino-2,6-dinitrotoluene ^c		_				_	_	X

Table 1-2. (continued).

COPCs	WAG 1	WAG 2	WAG 3	WAG 4	WAG 5	WAG 8 ^a	WAG 9	WAGs 6 and 10
RDX		_		_	_	_		X
HMX^{c}	_	_	_	_	_	_	_	X
1,3,5-Trinitrobenzene ^c	_	_	_	_	_	_	_	X
2,4,6-Trinitrotoluene	_	_	_	_	_	_	_	X
4-Methyl-4-hydroxy-2-pentanone	_	_	X	_	_	_	_	
2-Methylnaphthalene	X	_	_	_	_	_	_	_
Polychlorinated biphenyls, including aroclors-1248, -1254, and -1260 ^d	X^d	X^d	X^d	X^d	X^d	_	X^d	_
TPHs	X	_	_	X	_	_	_	X
Xylene ^b	_	_	_	_	_	_	_	_
Radionuclides ^e	_	_	_	_	_	_	_	_
Am-241, Co-60, Cs-134, Cs-137, Eu-152, Eu-154, Pu-238, Pu-239, Pu-239/240, Sr-90, U-235, U-238, and tritium	NA	NA	NA	NA	NA	_	NA	NA

a. Significant uncertainty exists in the screening-level ecological risk assessment (NRF 1997).

CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act

COPC = contaminant of potential concern

HMX = Her Majesty's Explosive

NA = not applicable

NRF = Naval Reactors Facility

OU = operable unit

RDX = Royal Demolition Explosive

TPH = total petroleum hydrocarbon

WAG = waste area group

b. Retained due to toxicity and common occurrence as a contaminant at CERCLA sites.

c. No sites have a hazard quotient >10 for this contaminant; however, it may be a potential contaminant of concern for postremediation confirmation sampling at ordnance sites.

d. Retained due to environmental persistence and potential for bioaccumulation.

e. Radionuclides were retained for OU 10-04 and were not screened for hazard quotients >10.

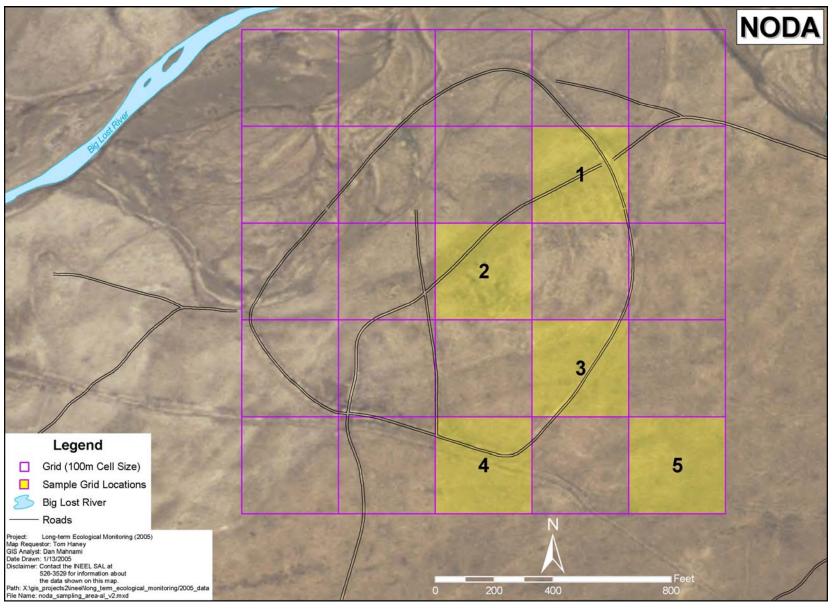


Figure 1-6. Map of the Naval Ordnance Disposal Facility showing the sampling plot.

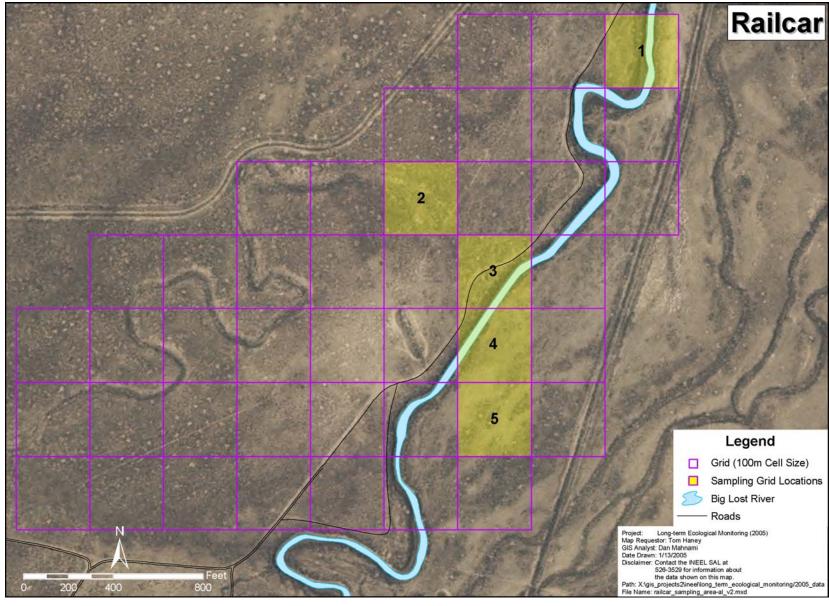


Figure 1-7. Map of Railcar Explosion Area showing the sampling plot.

Therefore, the contaminants most likely to have been transported to and may be present at the sinks are radionuclides, metals (e.g., mercury), and explosive compounds. Organics also might have been transported, but because of their volatile nature and the action of the river, they are not likely to be present at the sinks in detectable amounts. Other metals may also have been transported. However, the screening will focus on the contaminants most likely to be detected if present.

- 1.3.1.3 Probable Transport Pathways—Big Lost River Sinks. The Big Lost River could have transported contaminants present on the INL to the Big Lost River sinks and playas. Contaminants at the sinks could affect animals through skin contact, inhalation, ingestion, and external exposure. Animals like deer mice (Peromyscus maniculatus) or cottontail rabbits (Sylvilagus spp.) are most likely to contact the contaminants during foraging and burrowing. Animals could ingest soil-adsorbed contaminants during feeding, preening, or grooming. Plants and invertebrates in direct contact with contaminated soil could bioaccumulate contaminants. Animals could then be exposed indirectly by eating plants or animals that have absorbed or adsorbed contaminants from soil. During high winds, animals could inhale and ingest particulates. Ingestion also could occur if animals consume plants or invertebrates that have dust on them. Bioaccumulative contaminants, such as methyl mercury, could concentrate in animals and magnify within food chains.
- **1.3.1.4 Selection of Sampling Locations.** There is a great deal of uncertainty about if and where deposition of contaminants might be within the large area of the sinks. As stated previously, deposition zones and channels have changed throughout the years and it is difficult to select locations for sampling.

The areas identified as "General Sample Areas" on the maps of the Big Lost River sinks and playas (Figures 1-2 through 1-5) were defined based on the following:

- 1. <u>Basins</u>: Locations of local basins from 2-ft contour data where water may collect, are deeper than surrounding areas, and remain longer. These areas may provide aquatic habitat for a longer period of time and therefore attract aquatic biota and perhaps greater opportunities for reproduction. They also may act as areas where deposition of fine particulates may occur if they are outside the faster moving waters.
- 2. <u>Sediment Deposition Areas</u>: Areas where deposition has occurred and/or was most likely. These areas may be separated from very recent (last few flooding periods in the 1980s–1990s) to prior times. Since the United States Geological Survey mapped the hydrology on the 1:24K topography quad sheets, these areas were identified using the United States Geological Survey 1:24K topographical quad sheets, a 1:24K Geographical Information System hydrology coverage, satellite imagery, and aerial photography.
- 3. Wet Areas and Water Lines: Wet areas that would support aquatic habitat and associated fauna were identified using LANDSAT TM satellite imagery from 1984 and 1995. In addition, field data where previous aquatic data were collected in 1993, 1995, and 1997 also were used to map these areas.
- **1.3.1.5 Sampling Procedure for the Big Lost River Sinks.** Since this is a large area and there is uncertainty as to the location of potential contamination, a screening approach will be used to detect selected COPCs in areas with the highest probability of having accumulated contamination and exposure. This screening approach will be comprised of using field methods for determining if any elevated levels of selected COPCs are detected in the soil/sediment.

From the sinks and playas, 10 transects will be selected from the areas identified as having the most deposition from the figures provided. Five locations are identified in the actual sinks (Figure 1-2) since this area has the most potential for deposition from the activities at sites to the south. Two locations are identified at Playas 1 and 2 (Figure 1-3). Playas 1 and 2 were sampled by Stoller in 2002 and although they are the more visible area, they may not have as much sediment deposition (Martin 2004). One location at Playa 3 was selected (see Figure 1-4). Although this playa is large (note the maps are not comparable in scale), it is less likely that contamination may have reached this area. Finally, there are two locations at Playa 4 (see Figure 1-5). This playa is more likely to have deposition from the contamination from TAN facility activities.

At each of these locations, a 100-m transect will be used with three sampling coreholes at 0, 50, and 100 m. At each core hole, composite samples will be taken from 0 to 2 ft, 2 to 4 ft, 6 to 8 ft, 8 to 10 ft, or refusal. If stained soil is observed, an opportunistic sample can be taken from that area. If a greater depth can be reached, then the technical lead will decide if additional samples at greater depth should be taken. Samples taken for mercury and nitroaromatic field tests will be placed in small-size plastic bags (approximately 100 grams) and kept at 4°C until analyzed.

The field team will use commercially available test kits for determining presence/absence of TNT and RDX. There are several field colorimetric methods usable for detecting explosive contaminants in soil. The visual screening method (Mistral Security, Inc., Expray Kit, Israel) will be used at the INL. All of these energetic materials (EM) detection methods result in colored end products that can be easily monitoried by visual inspection; TNT, 2,4-DNT, TNB, RDX, HMX, NG, PETN, tetryl, and picric acid are all detected by using this technique. However, the focus will be on the determination of TNT and RDX and their by-products. The protocol for assessing soil is presented in the "Guide for Characterization of Sites Contaminated with Energetic Materials" (Thiboutot et al. 2002). If a sample within a core hole is found to have a detection, the location will be re-sampled and a sample from this depth will be sent to an accredited laboratory. All field test kits will be used according to manufacturer's recommendations.

All soil samples will be sent for radionuclide analysis to an INL field-based radionuclide measurement system at an onsite test facility. If any sample exceeds background concentrations, the technical lead will make the decision to send additional samples from that location to an off-Site qualified laboratory. See Table 1-3 for the required quantitation limits for any sample sent for laboratory analyses.

Table 1-3. Analytes, required quantitation levels, and analytical method.

	Requ	_		
	Soils	Biota	Water	
Analyte	(mg/kg or pCi/g)	(mg/kg or pCi/g)	(µg/L or pCi/L)	Proposed Method
Metals ^{a, b}				
Antimony	0.06	0.005	1.2	SW-846
Arsenic	0.7	0.03	5.0	SW-846
Barium	20.0	2.0	100.0	SW-846
Cadmium	0.09	0.005	1.0	SW-846
Chromium	0.4	0.15	2.0	SW-846
Cobalt	5.0	0.01	50.0	SW-846
Copper	0.6	2.0	1.0	SW-846
Lead	0.3	0.05	1.0	SW-846
Manganese	1.5	1.5	10.0	SW-846
Mercury	0.01	0.01	0.1	SW-846
Nickel	4.0	0.5	20.0	SW-846

Table 1-3. (continued).

	Requ	_		
	Soils	Biota	Water	
Analyte	(mg/kg or pCi/g)	(mg/kg or pCi/g)	(μg/L or pCi/L)	Proposed Method
Selenium	0.035	0.01	3.0	SW-846
Silver	0.13	0.005	1.0	SW-846
Strontium	2.0	2.0	0.2	SW-846
Thallium	0.1	0.002	0.4	SW-846
Vanadium	5.0	0.09	40.0	SW-846
Zinc	2.0	2.0	20.0	SW-846
Explosives ^b				
TNT	0.08	0.08	NA	SW-846 8330
RDX	0.08	0.08	NA	SW-846 8330
HMX	0.08	0.08	NA	SW-846 8330
2,4-Dinitrotoluene	0.08	0.08	NA	SW-846 8330
2,6-Dinitrotoluene	0.08	0.08	NA	SW-846 8330
2-Amino-4,6- dinitrotoluene	0.08	0.08	NA	SW-846 8330
4-Amino-2,6- dinitrotoluene	0.08	0.08	NA	SW-846 8330
Radionuclides ^b				
Gross alpha	10	10	4	Gas proportional counte
Gross beta	10	10	4	Gas proportional counte
Gamma emitters ^c	0.1	0.1	0.1	Gamma spectrometry
Americium-241	0.05	0.05	0.2	Alpha spectroscopy
Cesium-134 and -137	< 0.1	< 0.1	<30	Gamma spectroscopy
Cobalt-60	< 0.1	< 0.1	<30	Gamma spectroscopy
Europium-152, -154, and -155	<0.1	<0.1	<30	Gamma spectroscopy
Plutonium-238, -239, and -239/240	0.05	0.05	0.2	Alpha spectroscopy
Strontium-90	0.5	0.5	1.0	Gas flow proportional counting
Uranium-234 and -238	0.05	0.05	0.5	Alpha spectroscopy

Note: Required detection limits for all analytes may be elevated if dilutions are needed due to matrix interferences.

HMX = Her Majesty's Explosive

NA = not applicable

RDX = Royal Demolition Explosive

TNT = trinitrotoluene

Samples also will be analyzed for mercury concentration using a field analytical technique. The Zeeman Mercury Analyzer RA-915+ operates on the principle of thermal decomposition of the sample, allowing for direct measurement of mercury using atomic absorption spectrometry. Coupled with the RP-91C Pyrolysis Attachment, the instrument is capable of achieving detection limits on the order of less

a. High mineral concentrations and matrix complexity could cause dilutions to minimize interelement or matrix interference for metals analysis. Detection limits could be compromised if dilutions are needed.

b. Double volume is needed for laboratory quality control on radiochemistry parameters, and triple volume is needed for metals and explosives (increased volume is required for one sample per 20 samples).

c. Limited sample size or low density for matrixes other than soils could cause elevated detection limits for gamma spectrometry.

than 1 µg/kg using a 200-mg soil sample. The instrument will be operated in accordance with the manufacturer's instructions, JSA-808, and the following protocol.

The field instrument will be calibrated for efficiency each day it is used before analysis of the field samples. The calibration is performed following the manufacturer's procedures, using National Institute of Standards and Technology (NIST) certified soil standards: (1) Standard Reference Material No. 2710 certified at 32.6 ± 1.8 mg/kg total mercury (NIST 2003a) and (2) Standard Reference Material No. 2711 certified at 6.25 ± 0.19 mg/kg total mercury (NIST 2003b). Succinctly, field analysis for mercury is conducted in the following manner:

- 1. Calibrate instrument using NIST standards
- 2. Obtain sample aliquot for analysis and measure its mass (mg)
- 3. Enter sample description and mass into field instrument software
- 4. Place sample aliquot in analyzer
- 5. Start analysis
- 6. Upon completion of the day's analyses, software automatically computes total mercury concentration of the sample, and the file (including calibration data) is saved to the analysis computer hard drive.

1.3.2 Mass Detonation Area

Note that the soil and vegetation at the MDA were investigated in 2004, but too few deer mice were present to make complete samples; therefore, none were collected. In 2005, only small mammals will be studied at the MDA and, if present in high enough numbers, deer mice will be collected for laboratory analysis.

The MDA has been used for a number of small- to large-scale sympathetic and mass detonation tests. A sympathetic detonation test is a test to find out if a charge explodes when another charge is detonated next to it. During these large mass detonation tests, hundreds of thousands of pounds of explosives in land mines, smokeless powder, and bombs (with test shots ranging up to 500,000 lb of explosives) were placed in explosives storage bunkers or open sites and detonated to determine the effects on collocated bunkers and facilities. Stacks of ammunition were shot with high explosive projectiles to test their susceptibility to enemy fire.

The MDA soils remain contaminated with TNT, RDX, and degradation products. The MDA is still used to destroy the TNT and RDX fragments and unexploded ordnance from other INL ordnance locations. After remediation of all the other ordnance areas is considered complete, the MDA will be investigated to determine if the soil contamination exceeds risk-based levels. Remediation of the locations that exceed risk-based levels will most likely involve removal, treatment, and disposal at an approved facility on or off the INL Site.

1.3.2.1 Environmental Setting—Mass Detonation Area. The MDA is located approximately 1.6 km (1 mi) east of Mile Marker 8 on Lincoln Boulevard and approximately 3.2 km (2 mi) east of the Naval Reactors Facility (NRF) (see Figure 1-1). The site encompasses approximately 322 ha (796 acres). The MDA is near the Big Lost River, a stream that flows only during wetter years and infiltrates the

ground on the INL at the Big Lost River sinks. The aspect is generally flat with the terrain gradually sloping toward the Big Lost River channel.

Vegetation in the area predominantly consists of sagebrush and crested wheatgrass with lesser amounts of other shrubs, grasses, and forbs. The surrounding areas provide relatively continuous stretches of good sagebrush habitat both on and off lava.

The site has nine or more large craters varying in dimensions from a few feet to several tens of feet, a collapsed munitions storage bunker, and structures such as viewing bunkers. The site also is littered with pieces of explosives and structural debris scattered from past testing and recent ordnance detonation or disposal activities or both. The sagebrush-rabbitbrush and salt desert shrubs' habitats in the area support a number of species, including sage grouse and pronghorn (important game species). The western meadowlark (*Sturnella neglecta*) and mule deer (a game species) are supported by the grasslands habitat. However, no areas of critical habitat, as defined in 40 *Code of Federal Regulations* (CFR) 300, "National Oil and Hazardous Substances Pollution Contingency Plan," are known to exist in or around the MDA.

Six terrestrial avian species that are listed as T/E or sensitive species have the potential to occur near the MDA. These include the ferruginous hawk (*Buteo regalis*), the peregrine falcon (*Falco peregrinus*), the northern goshawk (*Accipiter gentilis*), the loggerhead shrike (*Lanius ludovicianus*), the burrowing owl (*Athene cunicularia*), and the bald eagle (*Haliaeetus leucocephalus*). Four sensitive mammal species potentially exist in the vicinity, including the pygmy rabbit (*Brachylagus idahoensis*), Townsend's western big-eared bat (*Plecotus townsendii*), long-eared myotis (*Myotis evotis*), and small-footed myotis (*Myotis subulatus*). The sagebrush lizard (*Sceloporus graciosus*) is the only sensitive reptile species potentially present. Burrowing owls have been sighted in this area in the berms along the road providing access from the west.

The grids shown in Figure 1-6 were placed over areas of known or suspected contamination using professional judgment and historical information. The sampling plots (1 through 10) were chosen by a random number generator.

1.3.2.2 Contaminants of Potential Concern—Mass Detonation Area. The COPCs for the MDA include TNT, RDX, and several degradation products.

In addition to TNT, RDX, and their associated degradation products, metals are considered COPCs for the MDA. For ecological receptors, the data collected will help determine whether significant adverse effects to plants and wildlife are occurring. See Table 1-3 for the required quantitation limits.

- 1.3.2.3 Probable Transport Pathways—Mass Detonation Area. Explosives can affect animals through skin contact, inhalation, and ingestion. Ecological receptors such as deer mice or cottontail rabbits are most likely to contact the contaminants during foraging and burrowing. Animals could ingest soil-adsorbed contaminants during feeding or during preening or grooming. Plants and invertebrates in direct contact with contaminated soil could bioaccumulate contaminants. Animals could then be exposed indirectly by eating plants or invertebrates that have absorbed or adsorbed contaminants from soil. During high winds, animals could inhale and ingest particulates. Ingestion also could occur if animals consume plants or invertebrates that have dust on them.
- **1.3.2.4 Selection of Sampling Locations—Mass Detonation Area.** The same sampling area and grid from last year's activities will be used at the MDA. The grid locations are presented in Figure 1-8.

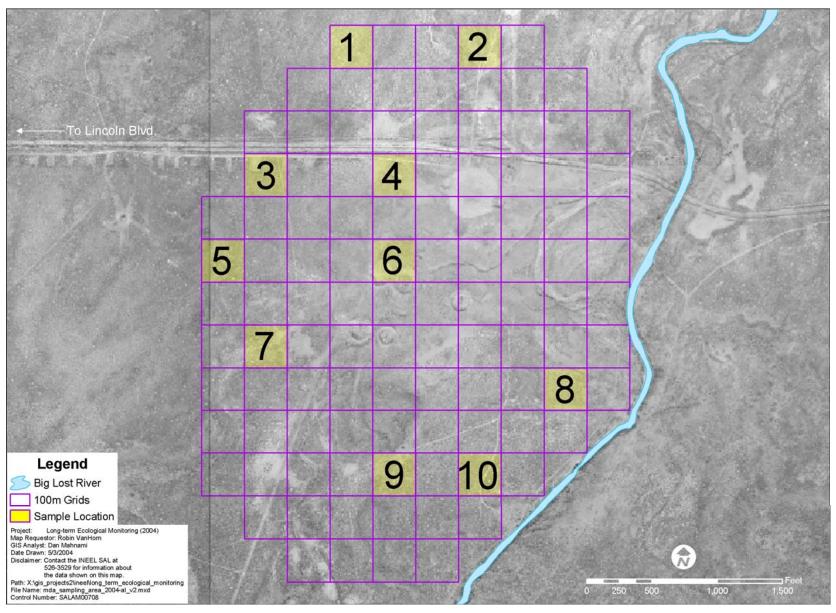


Figure 1-8. Map of the Mass Detonation Area showing randomly selected sampling grids (INEEL 2005-FSP from last year).

1.3.3 Naval Ordnance Disposal Area

The NODA is located approximately 1.6 km (1 mi) northeast of U.S. Highway 20/26 between Mile Markers 266 and 267 and about 3.2 km (2 mi) equidistant from the TRA, INTEC, and Central Facilities Area (CFA) facilities at the INL, as shown in Figure 1-6. The NODA was an ordnance and nonradioactive hazardous material disposal area used by the U.S. Navy during the 1940s. Following the establishment of the National Reactor Testing Station (now the INL), the NODA came under the control of a prime contractor for the U.S. Atomic Energy Commission (now the DOE). From about 1967 to 1985, the prime contractor treated (burned) approximately 3,175 kg (7,000 lb) of reactive materials at the NODA. Between 1967 and 1985, the NODA was also used as a storage area for hazardous waste generated at the INL. Until 1982, solvents, corrosives, ignitables, heavy-metal-contaminated solutions, formaldehyde, polychlorinated biphenyl materials, waste laboratory chemicals, and reactives were stored at this site. By October 1985, all these materials had been removed for offsite disposal as hazardous waste or treated onsite by open burning, as allowed by RCRA regulations (DOE-ID 1998; 42 USC § 6901 et seq.).

1.3.3.1 Environmental Setting—Naval Ordnance Disposal Area. The NODA site is located approximately 1.6 km (1 mi) northeast of U.S. Highway 20/26 between Mile Markers 266 and 267 and roughly 3.2 km (2 mi) equidistant from TRA (north-northeast), INTEC (northeast), and CFA (southeast) facilities at the INL. The site is adjacent to the main channel of the Big Lost River. The NODA lies within the Eastern Snake River Plain, which is a low-relief, low-elevation basin bordered by high mountains containing basalt lava flows and various sediments of alluvial, eolian, and lacustrine origin. It is a volcanic province that formed in response to movement of the North American tectonic plate. Large basin-and-range normal faults adjacent to the plain and basaltic volcanism on the plain are ongoing geologic processes that generate seismic and volcanic hazards for INL facilities. A detailed summary of the regional geologic history is given by Hackett and Smith (1992).

Historically, vegetation of the NODA area was similar to that of much of the rest of the INL site, consisting predominantly of sagebrush (*Artemisia* spp.), green rabbitbrush (*Chrysothamnus viscidiflorus*), crested wheatgrass (*Agropyron cristatum*), and needle-and-thread grass (*Stipa comata*) with lesser amounts of other shrubs, grasses, and forbs. However, a large range fire in 2000 extensively burned the area surrounding and including the NODA site. This fire resulted in an alteration in the plant community, effectively removing the dominant sagebrush from much of the area. Unlike sagebrush, green rabbitbrush is capable of re-sprouting from live roots following a fire, and the rabbitbrush has successfully regenerated in the area. Because the fire occurred late in the 2000 growing season after the perennial bunchgrasses (i.e., needle-and-thread grass and crested wheatgrass) had senesced, little damage to these species resulted. The NODA area is now dominated primarily by the green rabbitbrush and the bunchgrasses, primarily needle-and-thread grass.

The arid shrub and grassland communities of the INL provide habitat supporting a number of vertebrate species, including important game species such as sage grouse (*Centrocercus urophasianus*) and pronghorn (*Antilocapra americana*). The area surrounding NODA provides relatively continuous stretches of good habitat for numerous and diverse wildlife species. Large mammals such as mule deer (*Odocoileus hemionus*) and pronghorn are occasionally observed in the area. Birds—including yellow-headed blackbirds (*Xanthocephalus xanthocephalus*), northern harrier (*Circus cyaneus*), and western meadowlark (*Sturnella neglecta*)—are commonly observed in the area, especially near the ponds at facilities near NODA. However, no areas of critical habitat, as defined in 40 CFR 300, are known to exist at or near NODA.

1.3.3.2 Contaminants of Potential Concern—Naval Ordnance Disposal Area. The COPCs for NODA include TNT, RDX, and several degradation products. In addition to TNT, RDX, and their associated degradation products, metals are considered COPCs for NODA. Radionuclides are also

considered a potential COPC due to possible windblown contamination. For ecological receptors, the data collected will help determine whether significant adverse effects to plants and wildlife are occurring. See Table 1-3 for the required quantitation limits.

- 1.3.3.3 Probable Transport Pathways—Naval Ordnance Disposal Area. Explosives can affect animals through skin contact, inhalation, and ingestion. Ecological receptors such as deer mice or cottontail rabbits are most likely to contact the contaminants during foraging and burrowing. Animals could ingest soil-adsorbed contaminants during feeding or during preening or grooming. Plants and invertebrates in direct contact with contaminated soil could bioaccumulate contaminants. Animals could then be exposed indirectly by eating plants or invertebrates that have absorbed or adsorbed contaminants from soil. During high winds, animals could inhale and ingest particulates. Ingestion also could occur if animals consume plants or invertebrates that have dust on them.
- 1.3.3.4 Selection of Sampling Areas—Naval Ordnance Disposal Area. The NODA is one of the two areas selected to sample for explosive contamination in FY 2005 as part of the general ordnance areas (INEEL 2004); the Railcar Explosion Area is the other. The area of concern was reduced to the circle area where most of the deposition activity occurred (see Figure 1-6), although chunks of TNT and RDX have been found in other areas. From the 100×100 -m grid placed over this area, one area was selected biased to the most contamination (the burn pits), while the other four were randomly selected. This process optimizes the potential of detecting the presence and/or effects of contamination.

1.3.4 Railcar Explosion Area

The Railcar Explosion Area is approximately 3.2 km (2 mi) due west of Mile Marker 13 on Lincoln Boulevard and is adjacent to the Big Lost River channel, approximately 4.8 km (3 mi) northeast of NRF, as shown in Figure 1-7. It encompasses 195 ha (483 acres) and represents the debris scattered from a sympathetic detonation test involving five railroad cars, each loaded with 13,608 kg (30,000 lb) of explosive ordnance for a total of 68,040 kg (150,000 lb). The crater is located near the west bank of the Big Lost River. A mix of Amatol-loaded bombs and TNT-loaded Navy mines was used in the railcar detonation. The scattered white explosives (RDX) found at the site on both sides of the Big Lost River most likely originated from two small craters near the railcar crater. Large fragments of 5- and 8-in. projectiles with the explosive still in them can be found in and near both small craters. Historical documents indicate potential for bombs and Navy mines to be present in this area (DOE-ID 1998).

1.3.4.1 Environmental Setting—Railcar Explosion Area. The aspect is generally flat with the terrain gradually sloping toward the Big Lost River channel. Vegetation in the area predominantly consists of sagebrush and crested wheatgrass with lesser amounts of other shrubs, grasses, and forbs. The surrounding areas provide relatively continuous stretches of good sagebrush habitat both on and off lava.

The site has one large crater, several small craters, and is littered with pieces of explosives and structural debris. The sagebrush-rabbitbrush and salt desert shrubs' habitats in the area support a number of species, including sage grouse and pronghorn. The western meadowlark (*Sturnella neglecta*) and mule deer (a game species) are supported by the grasslands habitat. However, no areas of critical habitat, as defined in 40 CFR 300, are known to exist in or around the Railcar Explosion Area.

1.3.4.2 Contaminants of Potential Concern—Railcar Explosion Area. The Railcar Explosion Area's COPCs include TNT, RDX, and several degradation products. In addition to TNT, RDX, and their associated degradation products, metals are considered COPCs. Radionuclides are also considered a potential COPC due to possible windblown contamination. For ecological receptors, the data collected will help determine whether significant adverse effects to plants and wildlife are occurring. See Table 1-3 for the required quantitation limits.

1.3.4.3 Probable Transport Pathways—Railcar Explosion Area. Explosives can affect animals through skin contact, inhalation, and ingestion. Ecological receptors such as deer mice or cottontail rabbits are most likely to contact the contaminants during foraging and burrowing. Animals could ingest soil-adsorbed contaminants during feeding or during preening or grooming. Plants and invertebrates in direct contact with contaminated soil could bioaccumulate contaminants. Animals could then be exposed indirectly by eating plants or invertebrates that have absorbed or adsorbed contaminants from soil. During high winds, animals could inhale and ingest particulates. Ingestion also could occur if animals consume plants or invertebrates that have dust on them.

1.3.4.4 Selection of Sampling Locations—Railcar Explosion Area. The Railcar Explosion Area is one of the two areas selected to sample for explosive contamination in FY 2005 as part of the general ordnance areas (INEEL 2004); the NODA is the other. The area of concern was reduced to the area where chunks of TNT and RDX have been found (see Figure 1-7). From the 100×100 -m grid placed over this area, five plots were randomly selected. This process optimizes the potential of detecting the presence and/or effects of the contamination.

1.3.5 Test Area North

Test Area North covers approximately 41 ha (102 acres) of INL's north end. It is comprised of four facilities: (1) the TAN TSF, (2) the IET Facility, (3) the Water Reactor Research Test Facility (WRRTF), and (4) the Specific Manufacturing Capability (SMC) Facility/Loss-of-Fluid Test Facility (LOFT), as shown in Figure 1-9. Originally built between 1954 and 1961 to support the Aircraft Nuclear Propulsion Program sponsored by the U.S. Air Force and the U.S. Atomic Energy Commission, TAN's objectives were to develop and test designs for nuclear-powered aircraft engines. Upon termination of this research in 1961, the area's facilities were converted to support a variety of other DOE research projects. The three areas that will be evaluated in 2005 are TSF, WRRTF, and LOFT.

The TSF is located in the central part of TAN and serves as the main administration, assembly, and maintenance section for TAN and houses the fire department. At TSF, where the mission had been nuclear inspections, testing, and storage, some buildings are being left standing for future missions, but many buildings have been torn down (see Figure 1-10).

The WRRTF is located 1.6 mi south of TSF and was originally constructed to conduct pool and table reactor experiments. Various reactor programs were conducted at WRRTF, including the Semiscale (TAN-646), Thermal Hydraulic Loss-of-Coolant Project (TAN-646), the Blowdown Facility (TAN-640), and Two-Phase Flow Loop (TAN-640) loss-of-coolant projects (see Figure 1-11).

The LOFT is located 1 mile north of TSF. From 1962 through the 1970s, LOFT supported reactor safety testing and behavior studies. Beginning in 1980, the LOFT workers tested material from the 1979 Three-Mile Island reactor accident. Current activities at LOFT (now SMC) include manufacturing armor for military vehicles (see Figure 1-12).

The IET Facility was used for the Aircraft Nuclear Propulsion Program, which ended in 1961. Later it was used for the Systems for Nuclear Auxiliary Power Transient (SNAPTRAN) Program, and it is now inactive. The SNAPTRAN Program extended the Special Power Excursion Reactor Test reactor safety-testing program to aerospace applications. Three test series, involving three reactors, investigated the behavior of SNAP 10A/2 fuel under large, transient-power excursion conditions. The SNAPTRAN-1 was subjected to nondestructive tests in conditions approaching but not resulting in damage to the zirconium-hydride-uranium fuel. The SNAPTRAN-3 was the first of two destructive tests on a version of the small space reactor designed to supply auxiliary power in space. The test (conducted at IET on April 1, 1964) simulated the accidental fall of a reactor into water or wet earth such as could occur during

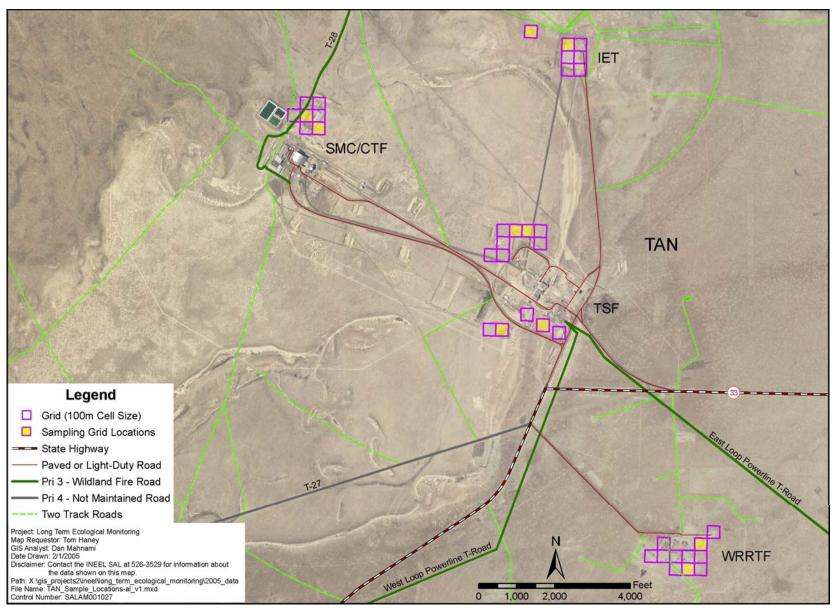


Figure 1-9. Map showing the location of the Test Area North facilities.

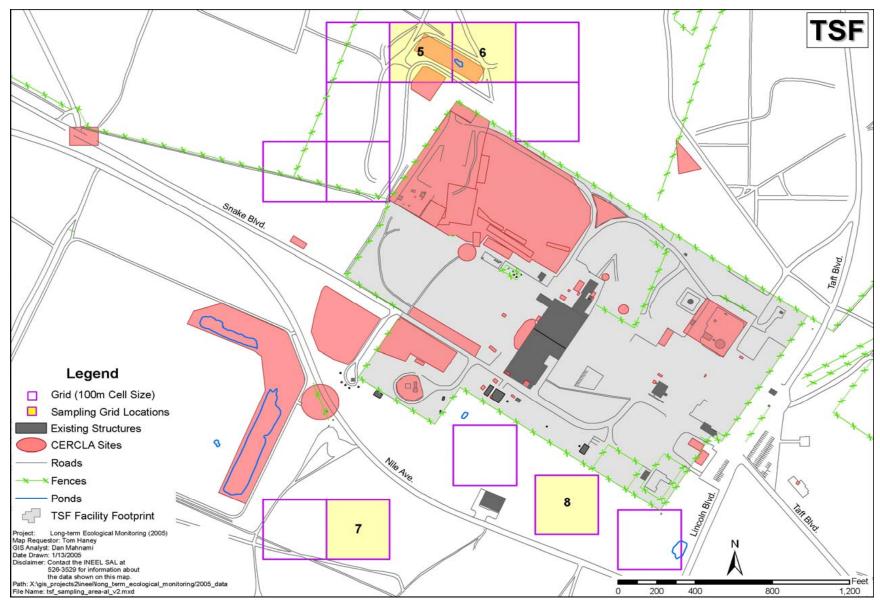


Figure 1-10. Map of Test Area North showing the sampling plot at the Technical Support Facility.

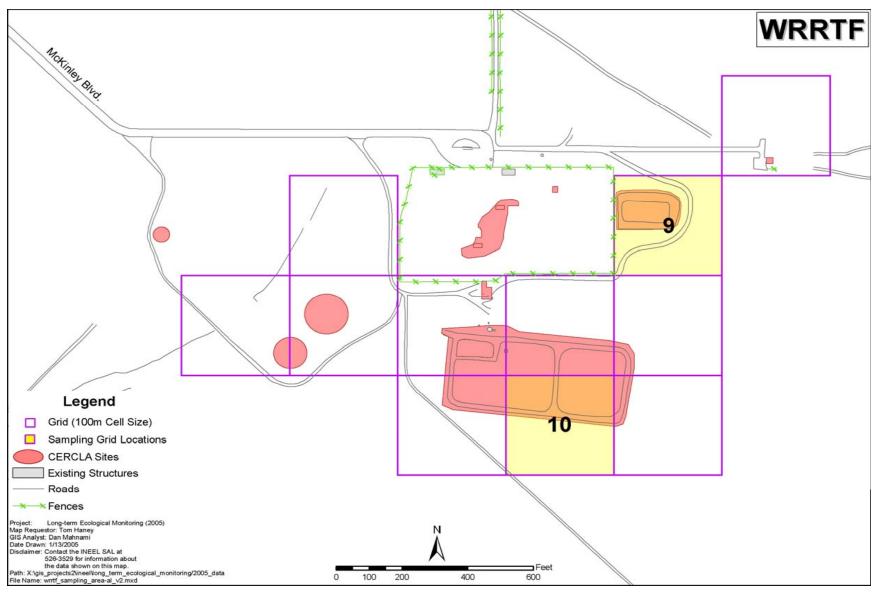


Figure 1-11. Map of the Test Area North showing the sampling plot at the Water Reactor Research Test Facility.

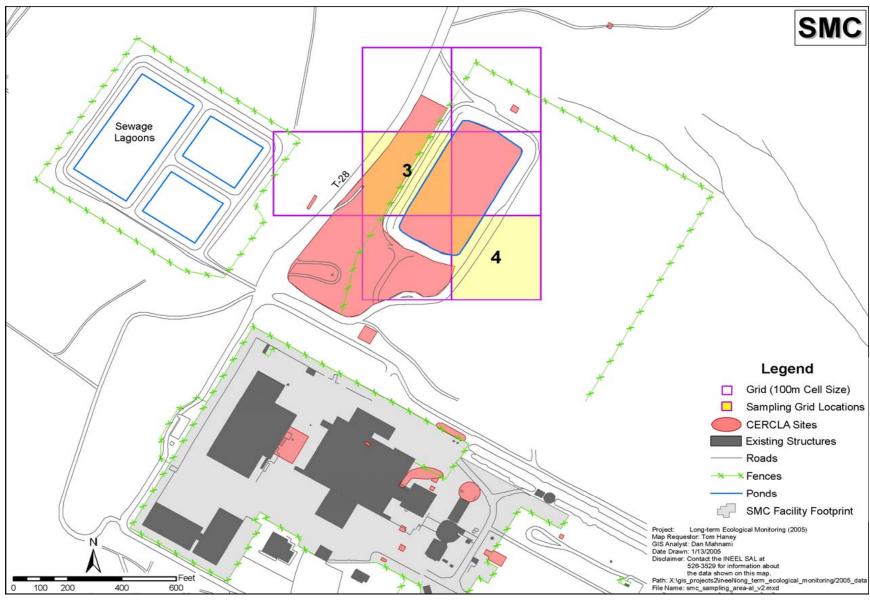


Figure 1-12. Map of the Test Area North showing the sampling plot at the Loss-of-Fluid Test Facility (Specific Manufacturing Capability).

assembly, transport, or a launch abort. This test version of the small space reactor, SNAP 10A/2, was intentionally destroyed on January 11, 1966. It provided information on the dynamic response, fuel behavior, and inherent shutdown mechanisms of these reactors in an open air environment. In normal operation, the control drums of the SNAP10A/2 were rotated to obtain criticality after the reactor had been placed in orbit. In case of a launch abort, however, impact on the earth might cause the drums to rotate inward, go critical, conceivably destroy itself and release fission products to the surrounding environment. The test data contributed to an understanding of reactor disassembly upon impact and methods for assessing or predicting the radiological consequences. Total deactivation, decommissioning, and dismantlement are complete at the IET and WRRTF where little is left above ground except fences (see Figure 1-13).

1.3.6 Selection of Sampling Locations for Ecological Monitoring

Due to the multiple areas that comprise the TAN site, the 10 plots usually used for an area were divided between these areas. At each location, grids were biased to areas that had both habitat and possible contamination but were not too disturbed by roads or other facility activities. At TSF, four grids were selected around this facility, with one biased to the northwest corner (see Figure 1-10). A large portion of this site was eliminated due to the landfill activity to the northeast of this site. At WRRTF, two locations were selected based on limited release of contaminants at this site. At SMC, two locations will be sampled from a very reduced area. This area is currently in use and activity to the south and west and the lack of habitat. Finally, at IET, two sites will be sampled. One was biased to the pit to the west that is being more extensively characterized, as discussed in Section 1.3.7, and the other was randomly selected from within the fenced area remaining after D&D.

1.3.7 Sampling for Initial Engine Test Ditch and Pit Characterization

Sampling also will be performed to provide additional characterization of a ditch and pit at IET. This ditch and pit are depicted in photographs Nos. 13195 and 13199 (Figures 1-14 and 1-15) taken in November 1954 during construction at the IET Facility. Figure 1-16 shows the IET pit and ditch as it looked in 2004. As can be seen in Figure 1-16, the pit and the line heading east to the former IET facility are clearly identifiable in 2004. However, the piping (if still in place) is not visible. Based on site visits, typical construction techniques, and construction photographs (see Figure 1-15) the pipe is believed to have been buried about 6 ft deep. A construction drawing from 1954 appears to show that the line is a 12-in. concrete pipe.

This site was previously investigated under the FFA/CO and a DOE New Site Identification Form was transmitted to DEQ and EPA on April 1, 1994. A description of the site from the form reads:

Construction of the ditch and pit is evident in 1954 photograph (# 13195). The earthen pit is approximately 30 feet in diameter and the bottom of the pit is six feet below grade. The ditch is approximately 3 feet deep and 300 feet long. A site survey was performed by Laurie Peterson-Wright (ER), Farrell Bush (RCT) and Bruce Miller (IH) on March 22, 1994. No visible surface staining was evident in the earthen pit or the ditch. Volatile organic vapors were 0 ppm measured with a Beckman Meter (Gov. ID 801455). Mercury vapors were 0 mg/m³ measured with a Jerome Mercury Analyzer (Gov. ID 281289). Background radiation was 80-100 cpm using a Ludlum 2A (Gov. ID 800077) and 15 uR using a Bicron 2000 (Gov. ID 801455). There were no radiation measurements greater than background.

A personal interview with Jerry Burtenshaw (TAN RCT) indicates that the ditch and pit were part of the original IET design. He believes the ditch and pad were intended to drain a decontamination pad but that the system was never used.

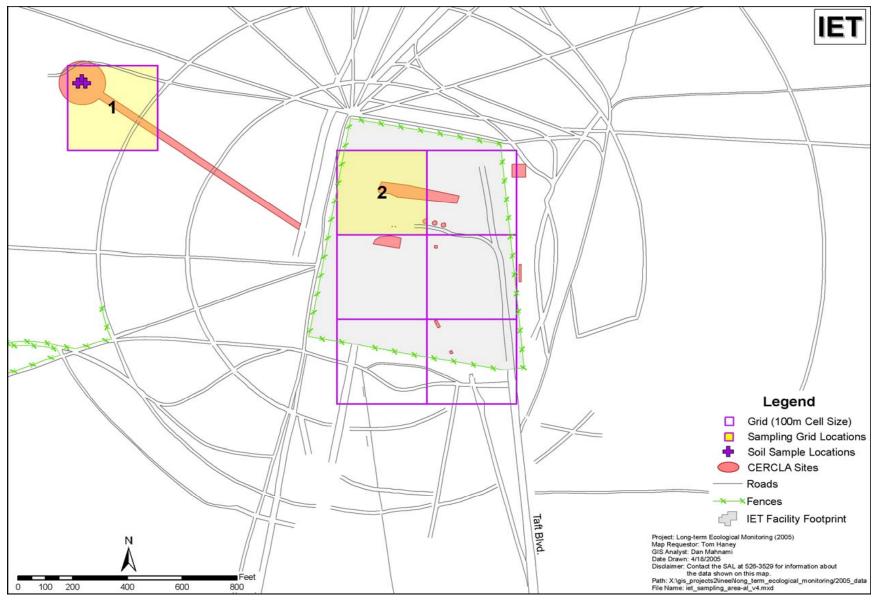


Figure 1-13. Map of the Initial Engine Test Facility showing the sampling plot.



Figure 1-14. Looking north toward IET, ditch and pit are in the upper left hand corner (1954).



Figure 1-15. Looking east toward IET, photo shows initial construction of pit and ditch (1954).



Figure 1-16. Looking east toward IET, photo shows pit and ditch in 2004.

The New Site Form recommended No Further Action. In the Scope of Work for Operable Unit 1-10 WAG 1 Comprehensive Remedial Investigation/Feasibility Study (INEL 1995), this site was listed as one of 94 CERCLA sites in Table 1: Status of WAG 1 Sites, "New Site ID and Determined not to be an Inactive Waste Site." This SOW was a primary document and no further investigation was performed on this site. In the Final Record of Decision for Test Area North, Operable Unit 1-10 (DOE-ID 1999), October 1999, this site is listed in Table 12-1 and recommended as a "No Action" site. Some of the information used to reach the No Action determination may have been incorrect and the pond potentially received radioactive and hazardous wastes from the Test Cell Building during the test conducted on the SNAP 10A/2 reactor on January 11, 1966. Contaminants that were potentially released to the pit included mixed fission products, mixed activation products, and metals, with mercury being the most likely risk-driven. The new site identification documentation from which the No Action determination was based relied upon information that the pond and line were never used. This is contrary to information obtained from archival drawings (see Drawing 106905 [902-4-ANP-620-A 320]), photographs documenting experiments in the test cell, and during recent interviews with former IET employees who were present during experiments at the Test Cell Facility during the late 1960s and early 1970s.

As can be seen in Figure 1-16, the pit and the line heading east to the former IET facility are clearly identifiable in 2004. However, the piping (if still in place) is not visible. Based on site visits, typical construction techniques, and construction photographs (see Figure 1-15) the pipe is believed to have been buried about 6 ft deep. A construction drawing from 1954 appears to show that the line is a 12-in. concrete pipe. The opportunistic sampling in FY 2005 is added to provide further characterization of this site prior to a possible Track 2 investigation. Characterization soil sampling will include three samples (see Figure 1-13) in the pit. The soil samples will be three composites taken from 0–6 in., 6–24 in., and 24–48 in.

1.3.7.1 Environmental Setting—Test Area North. The TAN facility is located at the north end of the INL, approximately 27 mi northeast of the CFA. The TAN facility is situated in flat playa and lacustrine sediments derived from Birch Creek and the ancient Lake Terreton. Mud Lake is a remnant of Lake Terreton.

Vegetation in the TAN area is predominantly green rabbitbrush (*Chrysothamnus viscidiflorus*), crested wheatgrass (*Agropyron cristatum*), and sagebrush (*Artemisia* spp.). There are lesser amounts of other shrubs, grasses, and forbs. Cattail (*Typha latifolia*), bulrush (*Scirpus occidentalis*), and other emergent aquatic plants dominate the wet areas.

The sagebrush-rabbitbrush and salt desert shrub habitats in the area support a number of species, including sage grouse and pronghorn (important game species). The area surrounding TAN provides relatively continuous stretches of good habitat for numerous and diverse wildlife species. Large mammals such as mule deer (*Odocoileus hemionus*) and pronghorn (*Antilocapra americana*) are occasionally observed in the area. Birds—including yellow-headed blackbirds (*Xanthocephalus xanthocephalus*), northern harrier (*Circus cyaneus*), and western meadowlark (*Sturnella neglecta*)—are commonly observed near the pond area. Buildings, lawns, and ornamental vegetation and disposal/drainage ponds are utilized by a number of species such as waterfowl, raptors, rabbits, and bats in the TAN area. The western meadowlark (*Sturnella neglecta*) and mule deer (a game species) are supported by the grasslands habitat. However, no areas of critical habitat, as defined in 40 CFR 300, are known to exist at or near TAN.

The use of the TSF-07 disposal pond at TAN by wildlife has been documented in *Wildlife Use of Wastewater Ponds at the Idaho National Engineering Laboratory* (Cieminski 1993). That report contains a complete list of species observed at the disposal ponds and their frequency (Cieminski 1993). The TSF-07 is 0.6 ha (1.5 acres), unlined, and active. It is frequented by waterfowl, including ducks, geese,

mergansers, and scaups; shorebirds, including avocets, sandpipers, killdeer, willets, phalaropes, coots, and grebes; swallows; and passerines, including blackbirds, sparrows, starlings, horned larks, and doves; and, to a limited extent, raptors such as kestrels, ferruginous hawks, and northern harriers (Cieminski 1993). The area has minimal fencing, and mammals (including coyotes, muskrats, and pronghorns) have been observed at the disposal ponds (Cieminski 1993). Although no amphibians are known to be present and no surface hydrology exists to support fish, aquatic invertebrates were observed at the pond (Cieminski 1993).

1.3.7.2 Contaminants of Potential Concern—Test Area North. Potential contaminants at TAN include:

- Radionuclides at TSF, LOFT (SMC), and IET
- Metals (especially mercury) at TSF, WRRTF, and IET.

For ecological receptors, the data collected will help determine whether significant adverse effects to plants and wildlife are occurring. See Table 1-3 for the required quantitation limits.

1.3.7.3 Probable Transport Pathways—Test Area North. Contaminants at TAN could affect animals through skin contact, inhalation, ingestion, and external exposure. Animals like deer mice (Peromyscus maniculatus) or cottontail rabbits (Sylvilagus spp.) are most likely to contact the contaminants during foraging and burrowing. Animals could ingest soil-adsorbed contaminants during feeding or during preening or grooming. Plants and invertebrates in direct contact with contaminated soil could bioaccumulate contaminants. Animals could then be exposed indirectly by eating plants or animals that have absorbed or adsorbed contaminants from soil. During high winds, animals could inhale and ingest particulates. Ingestion also could occur if animals consume plants or invertebrates that have dust on them. Bioaccumulative contaminants could concentrate in animals and magnify within food chains.

1.3.8 TRA-08 Cold Waste Ponds

The TRA is located in the southwest portion of the INL, approximately 7.9 km (4.9 mi) northwest of CFA. Established in 1950, three major nuclear reactors have been constructed at TRA for research and testing. Outside the double security fence surrounding TRA, the cold waste ponds are still in use today (see Figure 1-17), but they receive only uncontaminated effluent. Historical releases included Cs-137, chromium, tritium, Sr-90, and Co-60. In 1999, approximately 80 yd³ of Cs-137 contaminated soil was removed and transported to the warm waste pond for disposal to make the area suitable for industrial use.

- 1.3.8.1 Environmental Setting—TRA-08 Cold Waste Ponds. Situated in the flat, alluvial soils of the Big Lost River floodplain, TRA approaches 75 acres (30 ha) in size. Vegetation surrounding TRA consists predominantly of sagebrush (Artemisia spp.) and crested wheatgrass (Agropyron cristatum) with lesser amounts of other shrubs, grasses, and forbs. The surrounding area provides relatively continuous stretches of good sagebrush habitat. Site visits indicated that small mammals find shelter under the riprap boulders placed on top of the TRA warm waste ponds. Evidence of small mammal activity was observed along the fence surrounding the cold waste ponds. Many small and large mammal tracks and scat also were observed in the outlying areas.
- **1.3.8.2 Contaminants of Potential Concern—TRA-08 Cold Waste Ponds.** The COPCs in the cold waste ponds' sediments and water are primarily metals (arsenic, cadmium, copper, lead mercury, barium and selenium) as identified in Section 6 of the WAG 2 Comprehensive RI/FS (DOE-ID 1997). Radionuclides listed in Table 1-2 also will be assessed as discussed in the LTEM Plan (INEEL 2004). For ecological receptors, the data collected will help determine whether significant adverse effects to plants and wildlife are occurring. See Table 1-3 for the required quantitation limits.



Figure 1-17. Map of the TRA-08 cold waste ponds showing the sampling plot.

1.3.8.3 Probable Transport Pathways—TRA-08 Cold Waste Ponds. The cold waste pond contaminants could affect animals through skin contact, inhalation, ingestion, and external exposure. Ecological receptors like deer mice or cottontail rabbits are most likely to contact the contaminants during feeding, tracking, and burrowing. Animals could ingest soil-adsorbed contaminants during preening or grooming, drinking surface water, and eating insects that live in the contaminated soil or water. Some birds, like swallows, use the mud to build nests. During high winds, animals could inhale and ingest particulates. Ingestion also could occur if animals consume plants that have dust or pond water on them. In addition, plants rooting in contaminated soil or water could bioaccumulate contaminants. External exposure can occur from radionuclides in the soil and/or water.

1.3.9 Terrestrial Reference Area

The reference area locations were selected by considering soil type, disturbance, and habitat type. These types of information are critical to interpret the population data. Sagebrush steppe dominates the potentially impacted areas, so the habitat type matches the potentially impacted areas to the greatest extent possible. Figure 1-1 shows the reference area location. The reference area was selected from the proposed region where these three variables most closely match the WAG sites. Five sampling plots were randomly selected at each reference area location. All locations were surveyed using a global positioning system (GPS) unit and are shown in Figures 1-18 and 1-19.

1.3.10 Aquatic Reference Area

Chilly Slough, a marshy area located upstream from Mackay reservoir, is the aquatic reference area. It is outside the known INL plume area and should have negligible impact from the INL (see Figure 1-20). Five sampling locations in the same area that was sampled in 2004 will be selected based on the presence of water and/or aquatic plants. All locations will be surveyed using a GPS unit.

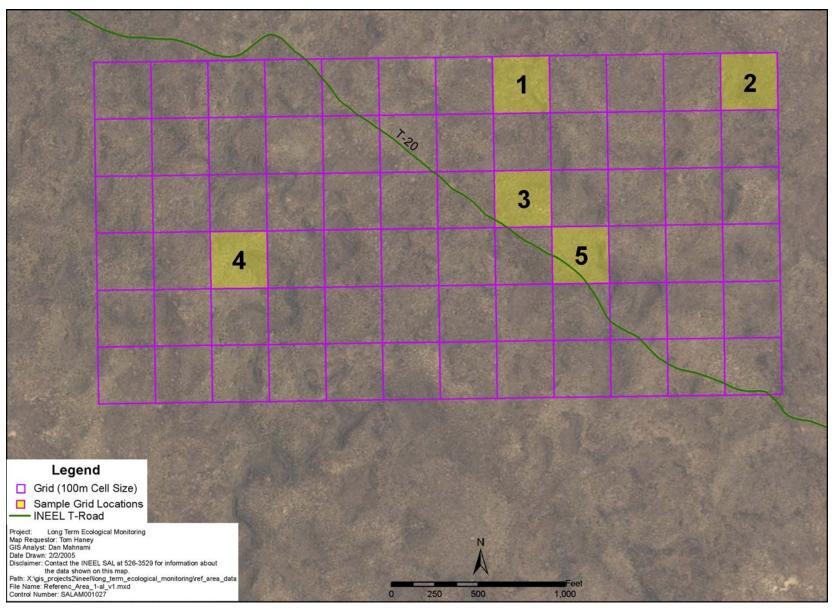


Figure 1-18. Map showing the location of Reference Area 1.

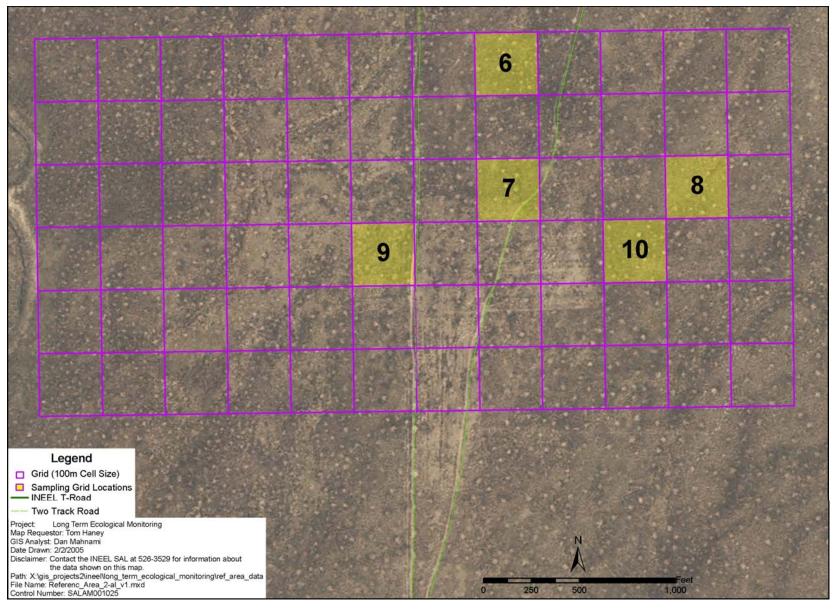


Figure 1-19. Map showing the location of Reference Area 2.

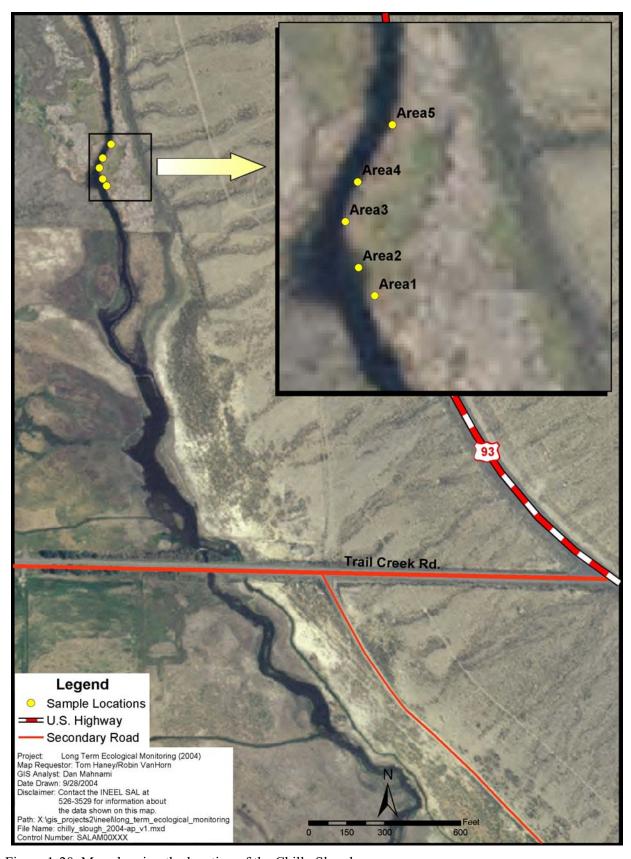


Figure 1-20. Map showing the location of the Chilly Slough area.

2. PROJECT ORGANIZATION AND RESPONSIBILITIES

The following subsections contain descriptions of the personnel associated with this FSP. Table 2-1 contains key personnel assignments and contact information. These responsibilities may change throughout the sampling effort. A logbook entry will be made to show the name of the individual performing the function.

Table 2-1. Proposed personnel and job assignments.

Assignment	Name	Phone
Technical lead	Robin VanHorn	208-526-1650
Work package manager	Tom Haney	208-526-9407
Field team leaders	Thomas Haney/Robin VanHorn	208-526-9407/208-526-1650
Sample and Analysis Management Program	Theron McGriff	208-526-2275

2.1 Technical Lead/Work Package Manager

The technical lead ensures that all activities conducted during the project comply with INL MCPs and program requirement documents (PRDs) as well as all applicable requirements of the Occupational Safety and Health Administration, U.S. Environmental Protection Agency (EPA), DOE, U.S. Department of Transportation, and State of Idaho. The technical lead coordinates all document preparation, field and laboratory activities, data evaluation, risk assessment, dose assessment, and design activities. The technical lead is responsible for field activities and for all personnel, including craft personnel, assigned to work at the project location. The technical lead is the interface between operations and project personnel and will work closely with the sampling team at the job site to ensure that the project's objectives are accomplished in a safe and efficient manner. The technical lead works with all other identified project personnel to accomplish day-to-day operations, identify and obtain additional resources needed at the job site, and interact with environmental, safety, health, and quality assurance (ESH&QA) oversight personnel on matters regarding health and safety. The work package manager is responsible for the overall work scope, schedule, and budget.

2.2 Field Team Leader/Job Site Supervisor

The field team leader (FTL) or job site supervisor (JSS) is the INL representative at the job site, with responsibility for safe and successful data collection. The FTL/JSS acts as the team leader and works with INL facility personnel, ESH&QA personnel, and the field sampling team to manage field sampling operations and to execute the characterization plan. The FTL/JSS enforces site control, documents activities, and may conduct the daily safety briefings at the start of the shift. Health and safety issues may be brought to the FTL's attention.

If the FTL/JSS leaves the job site during sampling operations, an alternate is appointed to act as the FTL/JSS. The identity of the acting FTL/JSS is conveyed to sampling personnel at the sampling location, recorded in the logbook, and communicated to the facility representative (when appropriate).

2.3 Health and Safety Officer

The health and safety officer (HSO) is located at the work site and serves as the primary contact for health and safety issues. The HSO assists the FTL in all aspects of health and safety, including complying

with the enhanced work planning process. The HSO is authorized to stop work at the site if any operation threatens workers or public health and safety. The HSO may be assigned other responsibilities, as stated in other sections of the project job safety analysis (JSA), as long as they do not interfere with the primary responsibilities stated here. The HSO is authorized to verify compliance with the JSA, conduct inspections, monitor decontamination procedures, and require and monitor corrective actions, as appropriate. Other ESH&QA personnel at the work site (i.e., safety coordinator, industrial hygienist, radiological control technician [RCT], radiological engineer, environmental compliance coordinator, and facility representative[s]) may support the HSO, as necessary.

The HSO, or alternate, must be qualified (in accordance with the Occupational Safety and Health Act definition [29 USC § 654(a) (1)]) to recognize and evaluate hazards and is given authority to take or direct actions to ensure that workers are protected. While the HSO may also be the industrial hygienist, safety coordinator, or, in some cases, the FTL (depending on the hazards, complexity and size of the activity involved, and required concurrence from the Idaho Completion Project ESH&QA manager) at the work site, other task-site responsibilities must not conflict (philosophically or in terms of significant added volume of work) with the role of the HSO at the work site.

If it is necessary for the HSO to leave the work site, then the HSO will appoint an alternate to fulfill this role. The identity of the acting HSO will be recorded in the FTL logbook, and work-site personnel will be notified.

2.4 Samplers

Samplers include all task-site personnel assigned to the characterization project to obtain samples for analytical purposes. All samplers (including INL, DOE, and subcontractor personnel) must understand and comply with the requirements of this document and other applicable documentation. The FTL/JSS will brief the sampling personnel at the start of each shift regarding the tasks to be performed and the applicable health and safety requirements. Work tasks, associated hazards, engineering and administrative controls, required personal protective equipment (PPE), work control documents, and radiological and emergency conditions are discussed during the prejob briefing.

Samplers are responsible for identifying any potentially unsafe situation or condition to the FTL/JSS and applicable ESH&QA representatives for corrective action. If it is perceived that an unsafe condition poses imminent danger, sampling personnel are authorized to stop work immediately and notify the FTL/JSS of the unsafe condition.

2.5 Waste Generator Services Waste Technical Specialist

The INL Waste Generator Services (WGS) waste technical specialist ensures that waste disposal complies with approved INL waste management procedures. The WGS personnel have the responsibility to help solve waste management issues at the task site. In addition, WGS personnel prepare the appropriate documentation for waste disposal and make the proper notifications, as required. All waste is disposed of using approved INL procedures in accordance with PRD-5030, "Environmental Requirements for Facilities, Processes, Materials, and Equipment."

2.6 Sample and Analysis Management Program

The Sample and Analysis Management (SAM) Program is responsible for helping to define the analytical project, generating the sampling and analysis plan table, and generating and issuing sample labels. The SAM Program determines the laboratory that will provide analytical services based on

established policies and contracts and prepares the task order statement of work. The SAM Program also tracks analytical progress and performs a cursory review of the final data packages. The SAM representative obtains data validation as directed by the project.

2.7 Environmental, Safety, Health, and Quality Assurance Support

The ESH&QA personnel are assigned to the job site to provide resources and expertise to resolve ESH&QA issues. Personnel assigned to provide ESH&QA support must be qualified to recognize and evaluate hazards, environmental concerns, or quality issues according to his or her expertise and are given the authority to take or direct immediate actions to ensure compliance and protection. In addition, ESH&QA personnel assess and ensure compliance with applicable INL procedures, including this document.

Radiological control support personnel are the source for information and guidance on radiological hazards at the job site. Radiological support personnel may include the radiological control supervisor, RCTs, and radiological engineers. The RCT is responsible for surveying the task site, equipment, and samples and for providing guidance on work activities in accordance with PRD-183, "Radiological Control Manual." The radiological engineer provides information and guidance relative to the evaluation and control of radioactive hazards at the job site, including performing radiation exposure estimates and as low as reasonably achievable evaluations, identifying the type(s) of radiological monitoring equipment necessary for the work, and advising personnel of changes in monitoring and PPE.

2.8 Data Storage Administrator

The data storage administrator is responsible for the maintenance of data records. All data will be maintained in accordance with Plan (PLN) -1401, "Transferring Integrated Environmental Data Management System Data to the Environmental Data Warehouse."

3. DATA QUALITY OBJECTIVES

The EPA developed the data quality objective (DQO) process to ensure that the type, quantity, and quality of data used in decision-making are appropriate for the intended application. The DQOs presented in this FSP are consistent with, but are not identical to, those presented in the LTEM Plan (INEEL 2004). These DQOs correspond to the field sampling activities planned for 2005, whereas the LTEM Plan has a broader, long-term focus. The DQOs for FY 2005 are summarized in Table 3-1. The DQOs for the IET pit area are summarized in Table 3-2.

Table 3-1. Data quality objectives for FY-05 long-term ecological monitoring.

1 doic 5 1. Du	ta quality objectives for FY-05 long-term e	cological monitoring.						
Problem Statement	The objective of sampling at each AOC identified in the LTEM Plan (INEEL 2004) is to evaluate the present level of contamination and identify potential effects to ecological receptors, as compared with the reference areas.							
Decision Statement	DS-1: Determine whether the levels of site-related contaminants, in either biotic or abiotic media, are elevated relative to the reference areas and whether ecological effects occur.							
	areas. Evaluate whether any correlation or	ted and effects are evident relative to the reference association exists between contaminants and effects ated studies, as discussed in the LTEM Plan						
		ted, but no effects are apparent relative to the tional associated studies, as discussed in the LTEM aminants identified as elevated.						
	AA-3: Site-related contaminants are not elevated, but effects are evident relative to the reference areas. Evaluate if additional contaminants are present to identify more sampling requirements.							
		evated, and no effects are evident relative to the appropriate level for trending, ensuring the remedy orting 5-year reviews.						
Inputs to the Decision	Characterization of contaminant concentrations: Contaminant concentrations in soils collocated with vegetation Contaminant concentrations in vegetation Contaminant concentrations in deer mice collocated with soil and vegetation samples Contaminant concentrations in receptors collocated with sediment and surface water samples.	 Characterization of effects: Vegetation community structure, plant bioassay Invertebrate community structure, invertebrate bioassay Mammal community structure, organ and body weights, histopathology, genetic analysis Avian community structure Avian egg count, hatching success, fledgling count, fledgling body weight Soil, physical, and nutrient characteristics. 						

Table 3-1. (continued).

Study Area Boundary	Areas to be sampled during FY 2005 include the Big Lost River sinks, the Mass Detonation Area, the Naval Ordnance Disposal Area, the Railcar Explosion Area, areas at the Test Area North, the TRA-08 cold waste ponds, the terrestrial reference area, and the off-Site aquatic reference area. Except at the Big Lost River sinks where a series of transects and field screening will be used, a 100×100 -m $(110 \times 110$ -yd) grid consisting of 100 -m² $(120$ -yd²) cells will be placed over the areas of known or suspected contamination. A similar grid will be placed over the reference area. Ten cells will be randomly selected from within the reference area. To ensure optimal distribution of cell allotments, subareas will be delineated in the areas of highest known contamination. Using a stratified random sampling approach, 10 cells (i.e., plots) will be selected from this grid based upon apportioning samples to the subareas by subarea areal extent. Sampling will be conducted in each plot so that samples are temporally and spatially collocated. Soil, plant, and small mammal samples will be collected from all locations.
Decision Rules	If analyte concentrations in any media exceed those at the reference areas (p <0.05 or other appropriate background evaluation), then determine if a correlation exists between contaminants and effects to determine the need for additional associated studies as discussed in the LTEM Plan (INEEL 2004).
	If site-related contaminants are significantly elevated compared to the reference area, but no effects are apparent relative to the reference areas based on an evaluation of the data, then evaluate the need for additional associated studies, as discussed in the LTEM Plan, to detect effects based on those contaminants identified as elevated.
	If site-related contaminants are not significantly elevated compared to the reference area, but effects are evident relative to the reference areas based on an evaluation of the data, then evaluate whether additional contaminants are present to identify additional sampling requirements. No further sampling will be performed if effects are related to physical disturbance, such as soil compaction or removal of topsoil.
	If site-related contaminants are not significantly elevated and no effects are evident relative to the reference areas based on an evaluation of the data, then further sampling (for monitoring or otherwise) will not be performed.
Specify Tolerable Limits on Decision Errors	Analyte concentrations can range from below detection limits to well above reference area concentrations. The study design is based on professional judgment, and preset limits on the decision error are not applicable because the sample size is fixed at 10 random locations. Statistics will be applied and trends will be evaluated. Error analysis will be carried out when feasible. The data are being collected for long-term needs that cannot be quantified at this point. The limits on decision errors are used to determine sample size, which in this case was based on expert knowledge to maximize resources.
Optimize the Sampling Design	The sampling design has been optimized to focus on the areas most likely to be impacted by sources of contamination. Environmental concentrations are likely to be higher near the facilities. If elevated concentrations in various media are not found close to the facility, it is unlikely they would be found farther away.
AA = alternative a AOC = area of cor DS = decision state FY = fiscal year LTEM = long-tern TRA = Test React	neern ement n ecological monitoring

Table 3-2. Data Quality Objectives for the IET pit area.

1 autc 3-2. Da	ta Quality Objectives for the IET pit area.
Problem Statement	To determine if the No Further Action recommendation in the New Site Form and Final Record of Decision was appropriate or if additional characterization under a Track 2 may be necessary for the IET ditch/line and pit, data are needed regarding concentrations of radionuclides and mercury in the soil.
Decision Statement	Decision Statement: Determine whether concentrations of radionuclides and metals in the soil in comparison to risk-based concentrations require:
	Alternative Action-1: Additional study/characterization under a Track 2 Investigation, or
	Alternative Action-2: No Further Action recommendation under the new site process was appropriate.
Inputs to the Decision	To resolve the Decision Statement, composite samples will be taken from three locations within the pit at 0–6 in., 6–24 in., and 24–48 in.
Study Area Boundary	The spatial boundaries will be in the pit.
Decision Rules	If either the gross alpha or gross beta results exceed approximately 25 and 35 pCi/g, respectively, or the ratio of the alpha/beta results appear skewed, then the laboratory will be instructed to complete additional speciated alpha or beta analyses, as appropriate.
	If analyte concentrations in the soil exceed risk-based or background concentrations, then evaluate the need for additional studies.
	If site-related contaminants are not elevated compared with risk-based or background concentrations, then the No further Action recommended in the New Site Form was appropriate.
Specify	Two types of decision errors could be made in regard to the IET pit:
Tolerable Limits on Decision Errors	First, determining that contaminants are present in the pit at concentrations that may pose an unacceptable risk to human health and the environment (when in fact they are not present), which would result in collection of unnecessary additional samples as part of a Track 2 investigation, resulting in further expenditure of project resources.
	Second, determining that contaminants are not present in the pit at concentrations that pose an unacceptable risk to human health and the environment (when in fact they are present), which would result in the assumption that the No Further Action decision was correct. This could result in CERCLA compliance issues and failure to protect the human health and environment.
	Biased composite soil samples will be collected at three locations within the pit from 0–6 in., 6–24 in., and 24–48 in. depths. This bias should indicate if any contaminated effluent from past activities at IET was discharged to the pit. Because biased samples will be obtained, statistically based decision error limits (Types 1 and 2) are not appropriate.
Optimize the Sampling Design	The sampling design focuses on the pit, which is the area most likely to have been impacted by the potential source of contamination.

4. SAMPLE COLLECTION, ANALYSIS, AND DATA MANAGEMENT

4.1 Sample Collection

4.1.1 Presampling Meeting

Before sampling takes place, project personnel will meet to ensure that sampling and analysis can be performed in a safe manner and will provide the project with usable data. Project personnel also ensure that all necessary equipment and documentation are present and all personnel understand the project scope and objectives.

4.1.2 Sampling and Analysis Requirements

Tables 4-1 through 4-12 provide general summaries of the areas to be sampled, analytes, sample depths and types, and the number of samples for the major analyses. Appendix A includes the sampling and analysis plan tables and the field guidance forms that together include all sample descriptions, locations, analysis types, quantities, containers, holding times, and preservative requirements that apply to samples being collected under this FSP.

At the Big Lost River sinks and playas, a combination of field screening and laboratory analyses will be used. Approximately 1 of each 10 field screening samples will be sent to the laboratory for verification analysis.

Table 4-1. Composite soil samples at the Big Lost River sinks and playas for both screening and analytical analysis.

Analytes	Sample Depth	Sample Media	Sample Type	Number of Samples
Screening of nitroaromatics ^a	0 to 2 ft 2 to 4 ft 4 to 6 ft 6 to 8 ft 8 to 10 ft >10ft ^b	Soil	Composite by depth—3 cores at the ends and middle of a 100-m transect at 10 locations	150
Explosives (TNT, RDX, HMX, 2,4-dinitrotoluene, 2-amino-4,6- dinitrotoluene, 4-amino-2,6- dinitrotoluene)	0 to 2 ft 2 to 4 ft 4 to 6 ft 6 to 8 ft 8 to 10 ft >10ft ^b	Soil	Composite by depth—1 core at the middle of a 100-m transect at 3 locations	15
Screening of radionuclides ^c	0 to 2 ft 2 to 4 ft 4 to 6 ft 6 to 8 ft 8 to 10 ft >10 ft	Soil	Composite by depth—3 cores at the ends and middle of a 100-m transect at 10 locations	150

Table 4-1. (continued).

Analytes	Sample Depth	Sample Media	Sample Type	Number of Samples
Radionuclides (Am-241, gamma spec., Pu-iso, U-iso, Sr-90)	0 to 2 ft 2 to 4 ft 4 to 6 ft 6 to 8 ft 8 to 10 ft >10ft ^b	Soil	Composite by depth—1 core at the middle of a 100-m transect at 3 locations	15
Screening for mercury	0 to 2 ft 2 to 4 ft 4 to 6 ft 6 to 8 ft 8 to 10 ft >10ft ^b	Soil	Composite by depth—3 cores at the ends and middle of a 100-m transect at 10 locations	150
Mercury	0 to 2 ft 2 to 4 ft 4 to 6 ft 6 to 8 ft 8 to 10 ft >10 ft	Soil	Composite by depth—1 core at the middle of a 100-m transect at 3 locations	15

Table 4-2. Composite biotic samples at the Mass Detonation Area for analytical analysis.

Analytes	Sample Depth	Sample Media	Sample Type	Number of Samples
Metals (TAL), (Sb, As, Ba, Cd, Cr, Co, Cu, Hg, Pb, Mn, Ni, Se, Ag, Sr, Ti, V, Zn) Nitroaromatics, (TNT, RDX, HMX, 2,4-dinitrotoluene, 2-amino-4,6-dinitrotoluene, 4-amino-2,6-dinitrotoluene) Radionuclides, (Am-241, Gamma spec., Pu-iso, U-iso, Sr-90)	NA	Deer mice	Composite of 5 to 10 animals at 10 plots	10

Table 4-3. Biotic samples at the Mass Detonation Area for effects analysis.

Assessment	Sample Depth	Sample Media	Sample Type	Number of Samples
Kidney and liver to body weight ratio	NA	Deer mice	5 animals at 10 plot (use deer mice collected for the analytical sampling)	50
Liver/kidney histopathology	NA	Deer mice	5 animals at 10 plot (use deer mice collected for the analytical sampling)	50

a. Screening of nitroaromatics, including TNT and RDX, will use a field test kit.
b. Sampling will be until refusal. Sampling at greater than 10 ft will be up to the task lead.
c. Screening of radionuclides for gamma.

Table 4-4. Composite biotic and collocated soil samples at the Naval Ordnance Disposal Area/Railcar Explosion Area for analytical assessment.

Analytes Sample Depth		Sample Media	Sample Type	Number of Samples
Metals (TAL) (Sb, As, Ba, Cd,	0 to 5 cm (0 to 2 in.)	Soil	Surface composite—5/plot	5/5
Cr, Co, Cu, Hg, Pb, Mn, Ni, Se, Ag, Sr, Ti, V,	5 to 61 cm (2 to 24 in.)	Soil	Subsurface composite—5 cores/plot	5/5
Zn)	NA	Deer mice	Composite of 5 to 10 animals/plot	5/5
	NA	Sagebrush	Composite of greater than 5 plants/plot	5/5
	NA	Crested wheatgrass ^a	Composite of greater than 5 plants/plot	5/5
Explosives (TNT, RDX,	0 to 5 cm (0 to 2 in.)	Soil	Surface composite—up to 5 borings/plot	5/5
HMX, 2,4- dinitrotoluene, 2-amino-4,6- dinitrotoluene, 4-amino-2,6- dinitrotoluene)	5 to 61 cm (2 to 24 in.)	Soil	Subsurface composite—up to 5 borings/plot	5/5
	NA	Deer mice	Composite of 5 to 10 animals/plot (use the deer mice collected for the selected metals sampling)	See above
	NA	Sagebrush	Composite of greater than 5 plants/plot	5/5
	NA	Crested wheatgrass ^a	Composite of greater than 5 plants/plot	5/5
Radionuclides (Am-241, gamma	0 to 5 cm (0 to 2 in.)	Soil	Surface composite—5/plot	5/5
spec., Pu-iso, U-iso, Sr-90)	5 to 61 cm (2 to 24 in.)	Soil	Subsurface composite—5 cores/plot	5/5
	NA	Deer mice	Composite of 5 to 10 animals/plot (use the deer mice collected for the selected metals sampling)	See above
	NA	Sagebrush	Composite of greater than 5 plants/plot	5/5
	NA	Crested wheatgrass ^a	Composite of greater than 5 plants/plot	5/5
a. Or other wheatgra	221	_		

Table 4-5. Biotic samples at the Naval Ordnance Disposal Area/Railcar Explosion Area for effects analysis.

Assessment	Sample Depth	Sample Media	Sample Type	Number of Samples
Kidney and liver to body weight ratio	NA	Deer mice	5 animals/plot (use deer mice collected for the analytical sampling)	25/25
Liver/kidney histopathology	NA	Deer mice	5 animals/plot (use deer mice collected for the analytical sampling)	25/25
Earthworm/seedling toxicity testing	0 to 30 cm	Soil	Composite from 5 subplots at each plot	5/5
Soil fauna	3 cm	Soil	One per plot, 3 in. diameter × 1.5 in. deep sample under sagebrush and duplicate	5/5
Avian population	NA	Birds	10 point count locations sampled 3 times	30
Reptile population	NA	Reptiles	Observation and tracks	TBD
Plant population	NA	Plant	50 Daubenmire subplots per plot	250/250
Animal population	NA	Small mammals	100 traps per plot/for six trapping nights (two weeks)	NA
Soil characterization ^a	TBD	Soil	1 location per grid	TBD
a. Using soil characterization kit.				

Table 4-6. Composite biotic and collocated soil samples at Test Area North for analytical assessment.

Analytes	Sample Depth	Sample Media	Sample Type	Number of Samples
Metals (TAL) (Sb, As, Ba, Cd,	0 to 5 cm	Soil	Surface composite—5/plot	10
Cr, Co, Cu, Hg, Pb, Mn, Ni, Se, Ag, Sr, Ti, V,	5 to 61 cm (2 to 24 in.)	Soil	Subsurface composite—5 cores/plot	105
Zn)	NA	Deer mice	Composite of 5 to 10 animals/plot	10
	NA	Sagebrush	Composite of greater than 5 plants/plot	10
	NA	Crested wheatgrass ^a	Composite of greater than 5 plants/plot	10
Radionuclides (Am-241, gamma spec., Pu-iso, U-iso, Sr-90)	0 to 5 cm (0 to 2 in.)	Soil	Surface composite—5/plot	10
	5 to 61 cm (2 to 24 in.)	Soil	Subsurface composite—5 cores/plot	10
2130)	NA	Deer mice	Composite of 5 to 10 animals/plot (use deer mice collected for the selected metals sampling)	10
	NA	Sagebrush	Composite of greater than 5 plants/plot	10
	NA	Crested wheatgrass ^a	Composite of greater than 5 plants/plot	10

Note: No duplicates for biota will be collected. The laboratory will prepare matrix duplicates from the appropriate digestates. a. Or other wheatgrasses, as appropriate. See Appendix B, Section B-2.1.1.

NA = not applicable.

Table 4-7. Biotic samples at Test Area North for effects analysis.

Assessment	Sample Depth	Sample Media	Sample Type	Number of Samples
Kidney and liver to body weight ratio	NA	Deer mice	5 animals/plot (use deer mice collected for the analytical sampling)	50
Liver/kidney histopathology	NA	Deer mice	5 animals/plot (use deer mice collected for the analytical sampling)	50
Earthworm/ seedling toxicity testing	0 to 30 cm	Soil	Composite from 5 subplots at each plot	10
Soil fauna	3 cm	Soil	One per plot, 3 in. diameter × 1.5 in. deep sample under sagebrush and duplicate	10
Avian population	NA	Birds	10 point count locations sampled 3 times	30
Reptile population	NA	Reptiles	Observation and tracks	TBD
Plant population	NA	Plant	50 Daubenmire subplots per plot	500
Animal population	NA	Small mammals	100 traps per plot/for six trapping nights (two weeks)	NA
Soil characterization ^a	TBD	soil	1 location per grid	TBD
a. Using soil characterization kit.				

Table 4-8. Composite biotic and collocated samples at the Test Reactor Area cold waste ponds for analytical assessment.

Analytes	Sample Depth	Sample Media	Sample Type	Number of Samples
Metals (TAL) (Sb, As, Ba, Cd, Cr, Co,	0 to 15 cm (0 to 6 in.)	Sediment	Grab sample from locations at water's edge	5
Cu, Hg, Pb, Mn, Ni, Se, Ag, Sr, Ti, V, Zn)	NA	Surface water	Grab sample from locations at water's edge	5
	NA	Aquatic receptor (if present)	Composite of multiple animals/plot to attain 60 g	5
	NA	Aquatic plant	Composite of 5 plants	5
Radionuclides (Am-241, gamma spec.,	0 to 15 cm (0 to 6 in.)	Sediment	Grab sample from randomly located grid cell	5
Pu-iso, U-iso, Sr-90)	NA	Surface water	Grab sample from randomly located grid cell	5
	NA	Aquatic receptor (if present)	Composite of multiple animals/plot to attain 60 g	5
	NA	Aquatic plant	Composite of 5 plants	5

Note: No duplicates for biota (in this case frogs or tadpoles) will be collected. The laboratory will prepare matrix duplicates from the appropriate digestates.

NA = not applicable

Table 4-9. Composite biotic and collocated samples at the terrestrial reference area for analytical assessment.

Analytes	Sample Depth	Sample Media	Sample Type	Number of Samples
Metals (TAL) (Sb, As, Ba, Cd, Cr, Co,	0 to 5 cm (0 to 2 in.)	Soil	Surface composite—up to 5 cores/plot	10
Cu, Hg, Pb, Mn, Ni, Se, Ag, Sr, Ti, V, Zn)	5 to 61 cm (2 to 24 in.)	Soil	Subsurface composite—up to 5 cores/plot	10
	NA	Deer mice	Composite of 5 to 10 animals/plot	10
	NA	Sagebrush	Composite of greater than 5 plants/plot	10
	NA	Crested wheatgrass ^a	Composite of greater than 5 plants/plot	10
Radionuclides (Am-241, gamma spec.,	0 to 5 cm (0 to 2 in.)	Soil	Surface composite—up to 5 borings/plot	10
Pu-iso, U-iso, Sr-90)	5 to 61 cm (2 to 24 in.)	Soil	Subsurface composite—up to 5 borings/plot	10
	NA	Deer mice	Composite of 5 to 10 animals/plot	10
	NA	Sagebrush	Composite of greater than 5 plants/plot	10
	NA	Crested wheatgrass ^a	Composite of greater than 5 plants/plot	10

 $Note: No \ duplicates \ for \ biota \ will \ be \ collected. \ The \ laboratory \ will \ prepare \ matrix \ duplicates \ from \ the \ appropriate \ digestates.$

NA = not applicable

Table 4-10. Biotic samples at reference area for effects analysis.

Assessment	Sample Depth	Sample Media	Sample Type	Number of Samples
Kidney and liver to body weight ratio	NA	Deer mice	5 animals/plot	50
Liver/kidney histopathology	NA	Deer mice	5 animals/plot	50
Earthworm/seedling toxicity testing	0 to 30 cm	Soil	Composite from 5 subplots at each plot	10
Soil fauna	3 cm	Soil	One per plot, 3 in. diameter \times 1.5 in. deep sample under sagebrush and duplicate	10
Avian population	NA	Birds	10 point count locations sampled 3 times	30
Reptile population	NA	Reptiles	Observation and tracks	TBD
Plant population	NA	Plant	50 Daubenmire subplots per plot	500
Animal population	NA	Small mammals	100 traps per plot/for six trapping nights (two weeks)	NA
Soil characterization ^a	TBD	Soil	1 location per grid	TBD
a. Using soil characterization kit				

a. Or other wheatgrasses, as appropriate. See Appendix B, Section B-2.1.1.

Table 4-11. Biased composite biotic and collocated samples at the aquatic reference area for analytical assessment.

Analytes	Sample Depth	Sample Media	Sample Type	Number of Samples
Metals (TAL) (Sb, As, Ba, Cd, Cr, Co, Cu, Hg, Pb, Mn, Ni, Se, Ag, Sr, Ti, V, Zn)	0 to 15 cm (0 to 6 in.)	Sediment	Grab sample from randomly located grid cell	5
	NA	Surface water	Grab sample from randomly located grid cell	5
	NA	Aquatic plant	Composite of five plants	5
Radionuclides (Am-241, gamma spec.,	0 to 15 cm (0 to 6 in.)	Sediment	Grab sample from randomly located grid cell	5
Pu-iso, U-iso, Sr-90)	NA	Surface water	Grab sample from randomly located grid cell	5
	NA	Aquatic plant	Composite of five plants	5

Note: No duplicates for biota will be collected. The laboratory will prepare matrix duplicates from the appropriate digestates. NA = not applicable

Table 4-12. Sampling for characterization of Initial Engine Test pit.

Analytes	Sample Depth Sa	mple Media	Sample Type	Number of Samples
Mercury	0–6" 6–24" 24–48"	Soil	Three surface/subsurface composites	3
Gross alpha/beta, gamma spec.	0–6" 6–24" 24–48"	Soil	Three surface/subsurface composites	3

The depth of the pipe at IET is unknown but thought to be about 6 ft below grade of the surrounding land surface.

The INL SAM Program is responsible for obtaining laboratory services for the required analyses in accordance with ICP-MCP-9439, "Environmental Sampling Activities at the INEEL." The SAM Program will prepare two Statement of Work (SOW) documents for laboratory services: (1) "Radiological Analyses of Samples Collected for the Long-Term Ecological Monitoring for 2005 at the INEEL," and (2) "Organic, Inorganic, and Miscellaneous Classical Analyses of Samples Collected for the Long-Term Ecological Monitoring for 2005 at the INEEL." These SOWs will include the analytical methods and the project-required detection limits for each analysis type listed in the Appendix A sampling and analysis plan tables and field guidance forms. Detection limits for each analysis type are included in Table 1-2.

Samplers coordinate with the analytical laboratory to ensure that the samples arrive at the laboratory to meet holding times. Holding times for biota samples are not established; however, approval of holding times of 6 months to 1 year is likely based upon other ecological studies (Marsh et al. 1996). Biotic samples will be preserved by refrigeration.

When required, quality control samples will be collected. If for some reason a sample is lost, containers are broken, or the sample is in some way unusable, then the sample will be retaken. The sampling FTL will ensure that any changes to this document regarding sampling frequency, location, and/or analyses are documented in the sample logbook. The project manager is responsible for ensuring

that a Document Action Request (DAR) (Form 412.11) is written and approved for any changes to this document.

A sampling logbook containing a written record for all field data gathered, field observations, field equipment calibrations, samples collected for analysis, and sample custody will be prepared. Field logbooks are legal documents that are maintained to ensure that field activities are documented properly as they relate to site safety meetings and site work being conducted in accordance with the health and safety procedures. Field logbooks are bound and contain consecutively numbered pages. All entries in field logbooks are made using permanent ink pens or markers. The person making corrections to an entry should draw a single line through the entry and then initial and date the correction. Data sheets will be used to collect data about plants and small mammals. The FTL will note the use of data sheets in the appropriate logbook.

4.1.3 Sample Documentation and Management

The FTL controls and maintains all field documents and records and submits required documents to the Administrative Record and Document Control office at the project's end. The appropriate information pertaining to each sample is recorded in accordance with MCP-1194, "Logbook Practices for ER and D&D&D Projects"; MCP-1192, "Chain-of-Custody and Sample Labeling for ER and D&D&D Projects"; and the *Quality Assurance Project Plan for Waste Area Groups 1, 2, 3, 4, 5, 6, 7, 10, and Deactivation, Decontamination, and Decommissioning* (DOE-ID 2004). The person designated to complete the sample or FTL logbook records items (such as presampling safety meeting notes, weather, and general project notes) in the logbook as appropriate. Proper handling, management, and disposal of samples under the control of Bechtel BWXT Idaho, LLC, or its subcontractors are essential. All samples are dispositioned in accordance with the appropriate procedures.

If it becomes necessary to revise these documents or other project documents, a DAR will be executed in accordance with MCP-233, "Process for Developing, Releasing, and Distributing ER Documents (Supplemental to MCP-135 & MCP-9395)." The DARs can include additional analyses that might be necessary to meet appropriate waste acceptance criteria.

4.1.4 Sampling Equipment

Table 4-13 includes a list of equipment and supplies required for this project. This list is as extensive as possible and includes equipment for both the analytical and effects data collection; however, it is not exhaustive and should only be used as a guide.

Table 4-13. Equipment and supplies list.

	Plot	Proximal Soil	Mammal Sampling		Vegetation Sampling	
	Preparation	Sampling	Effects	Analytical	Effects	Analytical
Flexible tape, 50 m or longer	X	X		X	_	X
Rulers	X	X				X
Survey stakes	X			X		X
Field forms, logbooks, and clipboards	X	X	_	X	_	X
Flagging tape (various colors)	X	X		X	_	X
Wildlife identification information	_	_		X		_
Small (mouse-sized) and medium		_		X	_	_

Table 4-13. (continued).

	Plot	Proximal Soil	Mamma	l Sampling	Vegetati	on Sampling
(11:4 ·	Preparation	Sampling	Effects	Analytical	Effects	Analytical
(rabbit-sized) live traps						
Absorbent material (e.g., paper towels and cloth rags)		X	_	X	_	X
Permanent markers, sample labels, and bar codes	X	X	_	X		X
Latex/nitrile gloves	_	X	_	X		X
EPA-approved sampling containers as specified by the analytical method (see QAPjP [DOE-ID 2004])	_	X	_	X	_	X
Logbooks	_	X	X	X	X	X
Sealable plastic bags (various sizes)	_	X		X	_	X
Strapping tape and duct tape	_	X	_	X		X
Data sheets	_		X	_	X	_
Distilled, deionized water (including decontamination water)	_	X	_	X	_	X
Sample preservatives as specified by analytical method (see FSP and QAPjP)	_	X	_	_	_	_
Plastic tubs for rinsing sampling equipment	_	X	_	X	_	X
Tweezers, tongs, and forceps		_		X		X
PPE, as specified by the JSA	X	X	_	X		X
Aluminum foil or plastic wrap		X	_		X	_
Plastic bubble wrap, starch packing beads, or foam sheeting for sample shipment (no diatomaceous earth)	_	X	_	X	_	X
Laboratory scales: 2-kg capacity with 0.1-g resolution; 200-g capacity with 0.01-g resolution	_	_	X	X	_	X
Global positioning system unit	X	_	_			_
Bleach for decontaminating traps and sampling tools	_	_		X	_	_
Scales for weighing animals (various sizes of Pesola)	_	_	_	X		_
Stainless-steel pans	_	X	_	X	_	X
Ear tags	_	_	X	_	_	_
Ear tagger	_	_	X	_	_	_
Disinfectant wipes	_	_	X	X		_

Table 4-13. (continued).

	Plot	Proximal Soil Sampling	Mamma	l Sampling	Vegetation Sampling	
	Preparation		Effects	Analytical	Effects	Analytical
Hand lens	_	X	X		X	
Dissecting kit		_	X			_
Stainless-steel scoops for soil sampling	_	X	_	_	_	_
Stainless-steel auger	_	X		_		_
Plastic containers (e.g., carboys) for containing used rinse water	_	X	_	X	_	X
Leather gloves (various sizes)	X	X		X	_	X
Plant press	_			_		X
Large and small coolers	_	X		X		X
Reusable ice packs		X		X	_	X
Shovels	X			_		_
Grass clippers	_			_		X
Pruning shears				_	_	X
Bait (peanut butter, molasses, grain)	_	_		X	_	_
Explosives test kit	_	X		_		_
Soil test kit	_	X		_		_
EPA = U.S. Environmental Protection Agence FSP = field sampling plan JSA = job safety analysis PPE = personal protective equipment OAPIP = quality assurance project plan	у					

QAPjP = quality assurance project plan

4.1.4.1 Field Equipment Calibration and Set-Up. The FTL works closely with sampling personnel to ensure that sampling equipment is operating as recommended by the manufacturer and according to design specifications. Presampling inspections of equipment are conducted to ensure that the equipment is functioning properly. Corrective actions for repair or maintenance of any sampling equipment will be immediate and confirmed by the FTL or project manager before proceeding with sampling.

Radiological control personnel are responsible for calibrating radiological monitoring equipment and placing and handling the telemetry dosimeters. Industrial Hygiene is responsible for measuring and evaluating chemical hazards. All calibrations will be documented in the calibration logbooks.

4.1.5 Sample Designation and Labeling

Each sample bottle contains a label identifying the field sample number, the analyses requested, the sample date and time, and the sampler. Labels are secured on the sample using clear plastic tape.

Uniqueness is required for maintaining consistency and preventing the same identification code from being assigned to more than one sample. A systematic character code may be used to uniquely identify all samples.

4.1.6 Chain of Custody

Chain-of-custody (COC) procedures begin immediately after collecting the first sample. At the time of sample collection, the sampling team initiates a COC form for each sample. All samples remain in the custody of a sampling team member until custody is transferred to the analytical laboratory sample custodian. Upon receipt at the laboratory, the sample custodian reviews the sample labels and the COC form to ensure completeness and accuracy. If discrepancies are noted during this review, immediate corrective action is sought with the sampling team member(s) relinquishing custody as identified on the COC. Pending successful corrective action, the laboratory sample custodian signs and dates the COC form, signifying acceptance of delivery and custody of the samples.

4.1.7 Sample Collection Procedures

Samples will be collected using the procedures in Appendix B; TPR-145, "Biotic and Proximal Soil Sampling"; and Guide (GDE) -279, "Surface Water Sampling for the Idaho Completion Project."

4.1.8 Equipment Decontamination Procedures

Decontamination of most sampling equipment will be accomplished using guidance in GDE-282, "Decontaminating Ecological Sampling Equipment for the Idaho Completion Project."

4.1.9 Sample Transport

Field team members will prepare the samples for transport in accordance with MCP-1193, "Handling and Shipping Samples for ER and D&D&D Projects," by securing the labels using clear tape, placing parafilm or stretch tape on the bottles to secure the lids, and placing the bottles in sealed bags. The field team member will wrap the samples in cushioning material and place them in the sample cooler. If necessary, the field team member will place Blue Ice (or equivalent) in the cooler to maintain the required temperature. The field team member will place the completed and signed COC form in the cooler, tape the cooler shut, and place the custody seals on the cooler to prevent tampering.

The field team member will complete the applicable shipping papers (Form Series 460 or 461, as applicable), secure address labels to the cooler, and deliver the coolers to the shipping authority for transport.

4.1.10 Waste Management

The analytical laboratory will dispose of samples submitted to it for analyses or will return them to the requestor as stated in the applicable task order SOWs. Samples returned from the laboratory will be accepted only if the original label is intact and legible. If the samples are returned, then the project manager is responsible for properly disposing of the sample with the assistance of WGS personnel. Disposal must be preapproved and documented by WGS personnel.

4.1.10.1 Solid Waste Management. Solid waste generated will include PPE trash and miscellaneous waste such as wipes and packaging. Waste that does not come into direct contact with the sampled media or sampling equipment can be disposed of as nonconditional, nonradioactive waste at the CFA landfill complex unless beta/gamma radiation or contamination above INL release criteria is detected.

All PPE and other waste material directly used in sampling, decontamination, etc., will be bagged and placed in containers recommended by WGS. All waste material resulting from the use of field kits

(e.g., mercury analyzer, TNT/RDX field kit) will be placed in containers recommended by WGS, which ensures proper disposition of the waste. The acetone used in the TNT/RDX field kit for soil extraction, and the ethanol used for soil fauna preservation, will be allowed to evaporate after the extraction is complete.

In the unlikely event that nonhazardous radioactive waste is generated, it will be disposed of at RWMC. Waste Generator Services will approve and prepare individual waste streams destined for disposal at RWMC or the Waste Experimental Reduction Facility in accordance with the *Idaho National Engineering and Environmental Laboratory Waste Acceptance Criteria* (DOE-ID 2005).

4.1.10.2 Soil-Specific Waste Management. Off-Site laboratories will dispose of both altered and unaltered samples as contractually required. However, on-Site laboratory gamma screening of samples is being completed, and these unaltered samples will be restored to the collection site. In the event that samples must be returned from the off-Site laboratory, only unused and unaltered samples in the original containers will be accepted. Although no samples are expected to be returned from the off-Site laboratory, and all screening samples are expected to be eligible for return to the collection site, disposition of samples that cannot be restored to a collection site is coordinated with the appropriate waste-generator interface. Such coordination will help to ensure compliance with applicable waste characterization, treatment, and disposal regulations.

Decontamination solutions used in small quantities might include deionized water, detergent, bleach/water, and isopropanol. It is anticipated that no decontamination fluids requiring containment will be generated during sampling. The use of spray bottles to apply the fluids will minimize the amount of decontamination fluids produced. Excess fluid will be allowed to drain onto the ground in the staging area used during sampling.

- **4.1.10.3 Waste Minimization.** Waste reduction philosophies and techniques will be emphasized, and personnel will be encouraged to continuously attempt to improve methods. Personnel must not use, consume, spend, or expend equipment or materials carelessly. Practices to be instituted to support waste minimization include, but are not limited to, the following:
- Restrict material (especially hazardous material) entering control zones to what is needed to do the work
- Substitute recyclable or burnable items for disposable items
- Reuse items when practical
- Segregate contaminated from uncontaminated waste
- Segregate reusable items such as PPE and tools.

Waste generated during the characterization project includes samples, sampling equipment, and PPE. These articles are handled, characterized, and disposed of in accordance with the *Idaho National Engineering and Environmental Laboratory Waste Acceptance Criteria* (DOE-ID 2005). Personnel from WGS coordinate waste disposal activities in accordance with INL procedures. Waste will be bagged, placed in containers, labeled, and stored in an approved storage area pending disposition. The project manager, with assistance from WGS, will prepare waste determination and disposition forms for determining the disposition routes for all waste generated during sampling and analysis.

4.2 Sample Analysis

Laboratories approved by the INL SAM Program will analyze the samples in accordance with project requirements, including ER-SOW-394, "Idaho National Engineering and Environmental Laboratory Sample and Analysis Management Statement of Work for Analytical Services."

Project-specific, request-for-analyses forms, or task order statement(s) of work identify additional requirements for laboratory analysis. The following subsections identify analysis requirements for the characterization project.

4.2.1 Analytical Methods

To ensure that data of acceptable quality are obtained from the characterization project, standard EPA laboratory methods or technically appropriate methods for analytical determinations will be used to obtain sample data. The SAM Program is responsible for obtaining laboratory analytical services for the required analyses in accordance with ICP-MCP-9439, "Environmental Sampling Activities at the INEEL." The SAM Program will prepare two SOW documents for laboratory services: (1) "Radiological Analyses of Samples Collected for the Long-Term Ecological Monitoring for 2005 at the INEEL," and (2) "Organic, Inorganic, and Miscellaneous Classical Analyses of Samples Collected for the Long-Term Ecological Monitoring for 2005 at the INEEL." These SOWs (along with Table 1-2) will include the analytical methods and the project-required detection limits for each analysis type listed in the Appendix A sampling and analysis plan tables and field guidance forms. Project-specific detection limits are presented in Table 1-2. Any deviations from this information will be fully documented, and the laboratory will inform the technical lead of the deviations. Methods for other less-typical activities, such as histopathic inspection of deer mice liver and kidney samples, will follow the contracted laboratory's standard protocol. Bioassays (earthworm and seedling toxicity tests) will be performed to appropriate standards of the American Society for Testing and Materials or other accepted methods, as determined by the technical lead.

4.2.2 Instrument Calibration Procedures

Laboratory instruments are calibrated in accordance with each of the specified analytical methods. The laboratory quality assurance plan must include requirements for calibrations when specifications are not listed in analytical methods. Calibrations that are typically not called out in analytical methods include ancillary laboratory equipment and verification of reference standards used for calibration and standard preparation. Laboratory documentation includes calibration techniques and sequential calibration actions, performance tolerances provided by the specific analytical method, and dates and frequency of the calibrations. All analytical methods have specifications for equipment checks and instrument calibrations. The laboratory complies with all method-specific calibration requirements for all requested parameters. If failure of instrument calibration or equipment is detected, then the instrument will be recalibrated, and all affected samples will be analyzed using an acceptable calibration.

4.2.3 Laboratory Records

Laboratories that analyze the samples are required to keep records of sample receipt, processing, analysis, and data reporting. Sample management records must document sample receipt, sample handling and storage, and the sample analysis schedule. The records will be used to verify that the COC and proper preservation are maintained, document anomalies in the samples, note proper log-in of samples into the laboratory, and address procedures used to prioritize received samples, thereby ensuring that the holding time requirements are met.

The laboratory is responsible for maintaining documentation that demonstrates laboratory proficiency with each method as prescribed in standard operating procedures. Laboratory documentation includes sample preparation and analysis details, instrument standardization, detection and reporting limits, and test-specific quality control criteria. Any deviations from prescribed methods must be recorded properly. Quality assurance/quality control reports will include general quality control records on activities such as analyst training, instrument calibration, routine monitoring of analytical performance, and calibration verification. Project-specific information (e.g., blanks, spikes, calibration check samples, replicates, and splits performed in accordance with project requirements) may be performed and documented. Specific requirements for the quantity and types of quality assurance/quality control monitoring and associated reporting formats will be specified in the task-specific laboratory SOW.

4.3 Data Management and Document Control

4.3.1 Data Reporting

A basic ordering agreement standard deliverable is required for all data reported for this characterization project. The final data documentation package will conform to the criteria specified in ER-SOW-394.

The environmental restoration (ER) SOW, prepared by the SAM Program, will be the standard for analytical data deliverable requirements for the laboratories used by the INL. All laboratories associated with this project will adhere to the document used to establish technical and reporting standards.

4.3.2 Data Validation

Analytical data validation is the comparison of analytical results with the requirements established by the analytical method. Validation involves evaluating all sample-specific information generated from sample collection to receipt of the final data package. Data validation is used to determine whether analytical data are technically and legally defensible and reliable. The final product of the validation process is the validation report. The validation report communicates the quality and usability of the data to the decision-makers.

All data generated for this project will undergo independent validation. The SAM Program arranges for validation. Level B validation is requested for all sample data reports generated during this project. The validation report contains an itemized discussion of the validation process and results. Copies of the data forms annotated for qualification are attached to the validation report.

4.3.3 Data Quality Assessment

The data quality assessment process will be used to ascertain whether the data meet the project DQOs. Additional steps of the data quality assessment process may involve data plotting, testing for outlying data points, and other statistical analyses relative to the characterization project DQOs.

For this characterization plan, a 90% completeness objective for all analyses has been established, because some sample locations might not contain enough material for all analyses requested. The completeness of the data is the number of samples collected and analyzed compared to the number of samples planned.

Precision is a measure of agreement among replicate measurements of the same property. Accuracy is a measure of the closeness of an individual measurement to the true value. Field and laboratory precision and accuracy should be within the limits and goals mentioned in the *Quality Assurance Project*

Plan for Waste Area Groups 1, 2, 3, 4, 5, 6, 7, 10, and Deactivation, Decontamination, and Decommissioning (DOE-ID 2004). Data results will be evaluated upon project completion to determine whether precision and accuracy goals have been met.

4.3.4 Final Characterization Report

A final characterization report will be prepared for this project in accordance with applicable program requirements. The final report will contain a summary of all sample data generated during this sampling effort. Appendixes containing all sample results may be attached. The final report also will describe the sample collection effort. A description of the data quality assessment process also may be included. The final report will discuss how the data will be used. The DQOs will be reviewed and evaluated to determine whether the characterization project's objectives have been met.

4.3.5 Document Control

Document control consists of clearly identifying all project-specific documents in an orderly manner, securely storing all project information, and controlling the distribution of all project information. Document control will ensure that controlled documents of all types related to the project receive appropriate levels of review, comment, and revision (as necessary). The project manager is responsible for properly maintaining project documents according to INL document control requirements. Upon completion of the characterization project, all project documentation and information will be transferred to compliant storage according to project, program, and company requirements. This information may include field logbooks, COC forms, laboratory data reports, engineering calculations and drawings, and final technical reports.

5. HEALTH AND SAFETY REQUIREMENTS

A health and safety plan is not required for this project. Instead, a hazard screening checklist was completed for this characterization activity in accordance with the requirements of MCP-3562, "Hazard Identification, Analysis, and Control of Operational Activities," to identify hazards associated with this project. Hazards identified on the checklist, along with corresponding mitigation requirements, are documented on a JSA in accordance with MCP-3450, "Developing and Using Job Safety Analyses." By virtue of completing the JSA, technical input and approval will be obtained from assigned ESH&QA personnel. The JSA identifies the potential hazards associated with this project.

6. REFERENCES

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